

Circuit Court of the United States.

MASSACHUSETTS DISTRICT.

IN EQUITY.

ROSS WINANS *vs.* THE EASTERN RAILROAD  
COMPANY.

EVIDENCE.

OCTOBER TERM, 1853.

COUNSEL.

RUFUS CHOATE.

CHARLES M. KELLER.

GEORGE T. CURTIS.

CHARLES P. CURTIS, Jr.

CHARLES G. LORING.

SIDNEY BARTLETT.

WM. WHITING.

BOSTON:

PRINTED FOR THE CLERK OF THE COURT.

1854.









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IN EQUITY.

EVIDENCE FOR RESPONDENTS.

UNITED STATES OF AMERICA.

DISTRICT OF MASSACHUSETTS, ss.

On the twentieth, twenty-first, twenty-third, twenty-eighth, and thirty-first days of August, A. D. one thousand eight hundred and fifty-three, respectively, personally appeared before me, the subscriber, Gridley Bryant, D. R. Nash, Noah Cummings, Jotham Cummings, John G. Simpson, and John R. Rowell, witnesses on the part of the Respondents, in a certain suit in equity, now pending in the Circuit Court of the United States, for the District of Massachusetts, wherein Ross Winans is Complainant, and the Eastern Railroad Company are Respondents.

And now, on the twentieth day of October aforesaid, the said Gridley Bryant, having been by me first duly examined, and cautioned, and sworn, to testify the whole truth, did depose and say, in answer to interrogatories propounded by William Whiting, Esq., Solicitor for the Respondents, as follows:

DEPOSITION OF GRIDLEY BRYANT.

*Int. 1.* What is your name, age, and place of residence?

*Int. 1.* My name is Gridley Bryant, I reside in Scituate, I am sixty-three years of age.

*Int. 2.* What has been and is your profession? when, where, and how long have you followed the same?

*Ans. to Int. 2.* My profession is and has been building and engineering; I have followed the same over forty years. I commenced building as soon as I came of age. My places of business have been in Boston. I built the light house on Saddle back Ledge, in Maine,

an iron beacon on York Ledge. I built the United States Bank in Boston, in 1823, and brought the columns there. I built a beacon at the mouth of the Connecticut River, about ten years ago. I commenced surveying, as engineer, the Quincy Railroad, in eighteen hundred and twenty-five and twenty-six, and finished it, so that the cars [?] in the October following. I superintended that road, as engineer and superintendent for ten years, till 1836. I had the whole management of it. I was then employed by a company to superintend a quarry in Frankfort, Maine. I then gave up my connection with the Quincy road, and went to superintend this quarry. The Quincy Railroad, the main part of it, is two miles in length, from the foot of the inclined plane to the foot of the landing at Milton. It has branches; there was a branch extending about a quarter, a third of a mile, to what was called the Bunker Hill Quarry. There was a branch extending round from the head of the inclined plane, to the south side of the quarry, or Pine Hill, between an eighth and a quarter of a mile long.

The branches were built in 1827. On the main road, from the foot of the inclined plane to the landing, there is one curve only, with about twelve or fifteen hundred feet radius; but, on the Bunker Hill branch, there were several curves, of not more than four hundred or four hundred and fifty feet radius. On the branch extending round Pine Hill, there were several curves, some of them not more than a hundred and fifty feet radii. There was one inclined plane and different planes to the road. The first grade from the landing was about twenty-six feet to the mile; the next grade was about thirteen feet; the next grade was sixty-six feet to a mile about, it wouldn't vary much. It was sixty-six feet when first built, and afterwards reduced four feet. On the Bunker Hill branch, the grades were not very large, but ascended and descended. The inclined plane was twelve or fifteen degrees inclination. I am sure it was twelve. The inclined plane operated by a double track, with a revolving chain, to which the cars were attached. The other trunk and branches were operated with cars and horse power.

*Int. 3.* Whether or not were you the designer and inventor of any of the apparatus used on said road; if so, what were the things you so invented and designed?

*Ans. to Int. 3.* Whatever was used there I was the delineator and projector of, and made the drawings. The first machinery we had was the high wheel carriages, with the load suspended under the axle-tree. The next were the four wheeled, low cars, and then the double four wheeled car, or eight wheel car. The next was the inclined plane, with the fixtures already enumerated, at the head of which was a turn table, similar to those now in use, which I presume was the first in the country. I had breaks to the wheels of all the carriages, windlass breaks, both to the high and the low cars, similar to those attached to cars now.

*Int. 4.* Are you acquainted, in your opinion, with the general principles of mechanics, theoretically and practically?

*Ans. to Int. 4.* I think I am.

*Int. 5.* Will you state what if any railway cars you invented, and when they were first invented, and when were they first introduced into actual operation?



*Ans. to Int. 5.* The high wheel cars were the first invented and used in 1826. The low wheel cars were invented and used on the road in 1828, and their use has been continued on the same road to the present time, single and double, and single and quadruple. One of the cars that was built while I was there is at the present time in use on the road, and all of the same description. The first high wheel cars are still in use.

*Int. 6.* Whether or not were any eight wheel cars made by you? if yea, when were they made, and put to use, and will you give a description thereof?

*Ans. to Int. 6.* There were eight wheel cars, or what we call eight wheel cars. They were made by me, under my direction, and were my invention, and were used as soon as eighteen hundred and twenty-nine. The use of them has been continued to the present time. I made all the designs, drawings, dimensions, and so forth, for the eight wheel car. The low four wheel car or truck were constructed to carry stones that were too wide to go between the wheels of the high wheel cars. The object of the eight wheel car was to carry stones that were too heavy and too large for four wheels. The machine was constructed so as to follow the curves of the road, and it would follow the inclined plane, similar to the four wheel cars.

The eight wheel car is described as follows: It consists of two cars or trucks of four low wheels each, the width of the railroad track is five feet; the distance from the centre of each axle in each truck is the same, five feet. The frame is made of heavy oak timber, and covered with plank of the same material. The frame is permanent, and as solid as it can be made. It consists of three string pieces laid across the axletrees; these three pieces are supported by the iron axletrees, and by a bed piece bolted solid under the bottom of the stringers. The iron axle is also let into a bed piece at each end of the truck, and the stringers rest on those bed pieces. Each truck has four wheels, made of cast iron, which revolve on an iron stationary axletree. The wheels are solid, with a flanch projecting about an inch and three-quarters, just like common railroad wheels now in use. There was about three-quarters of an inch play room between the flanches and the rail. The use of the centre bed piece is to support or distribute more properly the weight thrown upon the centre of the truck, when used with another car, or coupled together with another car. The use of the centre bed is to distribute the weight thrown in the centre of the car, when the two cars are coupled together.

When an eight wheel car is to be made, two of these trucks are connected together by three stout heavy timbers; through the middle of the centre timber, at each end, passes a ringbolt, the head of which is inserted in the car or truck and allowed to swivel in any direction, in order that the cars may follow the curves, or be reversed, either end foremost. These three timbers are supported at each end, on a bed piece or rocker. These rockers rest on an iron plate in the centre of each car, which is elevated about an inch or an inch and a quarter above the level of the car. Another plate was fastened on the bottom of the rocker or bolster, corresponding with the one already described. The head of the ringbolt was under the bottom of the plate on the

truck, the head being inserted through the plate and then the plate bolted or secured on to the centre of the truck. The bolt then passed through the iron plate at the bottom of the bolster, and then through the bolster and the centre timber which connects the two trucks or cars together. This frame through which the ringbolt passes from the trucks, is made heavy and strong, in order to support whatever load may be put upon it, or as much as the rails will bear on eight wheels. It is made very permanent and strong, and is in no ways flexible. At either end of the bolsters on each car there is a friction plate, on which the bolster, when it rocks, is supported, by any inequality in the rails. Corresponding to these friction plates, on the car or truck, are others on the bottom of each bolster, placed directly over those on the car. These plates on the truck and also on the bolsters are circular, to correspond with the radii from the centre of each ringbolt. These friction plates or side bearings are for the purpose of allowing the cars or trucks to follow the curves in the road with ease and freedom. The bolsters at each end of the frame which connects the cars or trucks together, are made circular, longitudinally, or rounded on the bottom part, so as to let the forward end of the cars be elevated so as to pass from the main rail road on to the inclined plane; and also the bolsters are rounded up in the rear parts, to allow the cars to descend from the inclined plane on to the main road, or to follow the grades of the road and the inclined plane. The frame that connected the four wheel trucks, were between twelve and fourteen feet long. The model is a fac simile of the cars or trucks used on the Quincy Railroad, in 1828 or 1829, in miniature. The model referred to is now produced and marked "G. Bryant."

*Int. 7.* Whether did you make any sixteen wheel car, and when? how was it made, and for what purpose?

*Ans. to Int. 7.* I did, in eighteen hundred and thirty-three, or about then. I constructed a car of sixteen wheels, for the purpose of carrying stones that were too heavy for the rails when placed on eight wheels. This sixteen wheel car has carried stones of more than sixty tons weight from the top of the quarry down the inclined plane and the whole length of the Rail Road. This car was made by connecting two eight wheel cars together by a frame similar in all respects to those used on the eight wheel cars, except the cross piece in the centre. This frame is connected with the two eight wheel car frames by plates and ringbolts and friction beds, the same as above described. I herewith produce a drawing representing the said sixteen wheel car, to be annexed to and taken as a part of this my deposition, and marked "G. Bryant." This sixteen wheel car was constructed mainly for the purpose of carrying the stone of which the columns of the present Court House in Boston were made, and it was used for that purpose as well as others.

*Int. 8.* Whether or not were the eight wheel cars you have spoken of openly and publicly used on said Quincy Rail Road on and after 1829? and what persons or committees visited the Road to see these cars?

*Ans. to Int. 8.* This Rail Road being the first one built in the country, excited a good deal of curiosity and interest. Individuals from the

city and elsewhere visited it every fair day by hundreds, while in construction, and also engineers and committees from several Rail Roads; from at least one railroad I know. This lasted for several years, to a certain extent, after the road was in operation. Among the visitors were engineers—Mr. Latrobe, then a young man, in what year I don't know—Mr. Jervis, of New York, who spent a day or two with us, taking the details before he commenced the Albany and Schenectady Railroad, as well as a committee of gentlemen from Charleston, South Carolina, before they commenced the Charleston and Columbia Railroad. Gentlemen from various parts of the country, as well as some from Europe, visited the road, from the time of its construction, for several years subsequent. All the carriages then in use and now in use were publicly used, and described and explained to visitors generally. I have occasionally visited the road ever since I left it as Superintendent in 1836.

*Int. 9.* Whether or not there is any difference in mechanical principle between the eight wheel cars now generally used and the eight wheel car you have described?

*Ans. to Int. 9.* I should think there is none. The principle is exactly the same. There are some additions, such as friction rollers instead of friction plates.

*Int. 10.* Does the increase of the size of the wheels make any difference in their mechanical principles or in the mode of operation of the eight wheel car?

*Ans. to Int. 10.* Not any.

*Int. 11.* Does the change from the wheels which turn on the axes to wheels turning with the axes involve any change in mechanical principles; and were both wheels well known substitutes for each other when the eight wheel cars were made?

*Ans. to Int. 11.* It does not involve any change, and both kinds were well known substitutes for each other before then.

*Int. 12.* Whether or not were said eight wheel cars so constructed as to be capable of going at as rapid rates as the present rail road cars, and so as to carry their loads safely and smoothly, conforming to the curves and grades of the road?

*Ans. to Int. 12.* I do not see any reason why they may not be made to go as fast, though they never were driven at so fast a rate. The load of stone is a different material, and the cars were not boxed up. The stones that are carried in the cars on that railroad, vary from a pound to sixty tons. Small stones couldn't be carried at a great speed, without being jostled out, unless the sides were boxed up, which they never were; while any load, composed of one or two stones, might be carried at any speed, on any railroad, if in good repair; and upon this railroad, if in good repair, at any speed.

*Int. 13.* Was said eight wheel car made only for temporary purposes, or was it a fully organized machine?

*Ans. to Int. 13.* I considered it a fully organized machine, to be used whenever occasion required. I considered it one of the permanent carriages; it could be taken to pieces. We could not have carried on the business without having this to resort to.



And in answer to the following cross interrogatories, propounded by C. P. Curtis, Jr., Esq., Solicitor for Complainant, the said Deponent further deposeth and saith as follows:

1 *X Int.* Was the Quincy Railroad built or used for the transportation of passengers?

*Ans. to 1 X Int.* It was not.

2 *X Int.* Has the Quincy Railroad ever been used for any other purpose than to convey stone from the quarry to navigable water?

*Ans. to 2 X Int.* Not in a business point of view. We have transported the materials for our own use, from one end to the other—lumber, and so forth.

3 *X Int.* What motive power was used on the Quincy road?

*Ans. to 3 X Int.* Horse power.

4 *X Int.* What was the average rate of speed?

*Ans. to 4 X Int.* Downward, about four miles an hour; and in returning, with empty cars, about five or six miles.

5 *X Int.* Where was the point of draft after you had joined two four wheeled cars together—by one of the cars, or by the framework on top?

*Ans. to 5 X Int.* The draught was at the centre timber of the frame of the truck, and the same place in a four wheel car.

6 *X Int.* What was the length of each four wheel car, on the top of its platform?

*Ans. to 6 X Int.* I have not the dimensions, but I believe about seven feet. It might be seven and a half.

7 *X Int.* What was the length of space between the two trucks of your eight wheeled car?

*Ans. to 7 X Int.* About three feet; this is only from recollection. I do not recollect exactly. It must have been as much as *five* feet.

8 *X Int.* What is the principle of the eight wheel cars for passengers, now in common use?

*Ans. to 8 X Int.* The principle of the eight wheel passenger car, now in use, and also of the baggage car, is carriages or boxes, set upon two four wheeled trucks. These trucks are connected to the frame of the carriage, by a ringbolt, on which the truck or car swivels, and follows the curves of the road.

9 *X Int.* Have you testified before to these facts? and, if yea, when and where?

*Ans. to 9 X Int.* I made an affidavit of them last winter, in this city.

*Direct Examination resumed.*

1st *Direct Int. res.* Were or were not all the platforms connecting the four wheel trucks, so as to constitute the eight wheel cars of uniform, or of different length?

*Ans. to 1st Dir. Int. res.* The eight wheel car platform, and the sixteen wheel car platform, were of the same length.

GRIDLEY BRYANT.

## DEPOSITION OF DAVID R. NASH.

*Int. 1.* What is your name, age, residence, and what was your business in 1829?

*Ans. to Int. 1.* My name is David R. Nash, I am forty-four years old, I reside in Dorchester, and I was clerk for the Quincy Granite Railway Company, in the years 1828, 1829, and a part of the year 1830.

*Int. 2.* When and where did you first see any eight wheel railway cars? and where if at any place, did you see them in use?

*Ans. to Int. 2.* I saw them in the spring of 1829, for the first time, on the railway that run round the quarry of the Quincy Granite Railway Company. The first use that I saw of the eight wheel trucks was in taking the door sill of the United States Dry Dock, at Charlestown, from the south side of the quarry down the inclined plane and over the Railway to the wharf at Neponset River. The engineers of the Dry Dock, Mr. Baldwin and Capt. Parris, sent messages for this sill to Mr. Bryant. Mr. Bryant made answer to me that he had to construct a car to bring it round from the south side of the quarry down the inclined plane and carry it to the wharf, and the model now present marked G. Bryant is a perfect model of what the car was then. The car was built for the purpose of carrying all large stones that could not be carried on the carriages of large wheels then in use where the load was swung under the axle. It was used for the purpose of carrying all stones, all large stones, and the same kind of carriages have been in use from that day to the present. There has scarcely been a year from that day to this that I have not been there three or four times a year.

*Int. 3.* Will you give a general description of the eight wheel cars?

*Ans. to Int. 3.* The track was five feet wide and the axletrees of the wheels were just the same distance from each other, making a perfect square. Connecting the axletrees were three timbers laying on the axletrees, and supported by a timber underneath, running crosswise. The wheels revolved on their axes, and the wheels were like common railroad wheels. On the timbers was a solid oak platform, making the frame work rigid and immovable; the platform was six by seven or eight. Running up through the centre of the platform of the truck, and securely bolted thereto by a plate fastened on to the platform by bolts, or otherwise, was a transom bolt or ringbolt, which passed up through an iron bearing on the bottom of the bolster or bed-piece, and through said bolster and the middle stringer, being near the end of the frame work or carriage. There were side bearings on the two sides of the platform of the truck, shaped like sections of circles, with corresponding bearings on the bottom of the bolster or bed piece; the bottom of the bolster and the iron plate on it, being rounded up, before and behind, so as to permit the truck to rise and fall as it passed over the different grades of the road, and to swivel as it passed the curves or switches, permitting the load on the carriage at all times to be borne on the centres of the trucks, while the wheels could also adapt themselves to any inequality in the level of the rails, by means of the play on the centre of the ring bolt, aided occasionally by the side bearings,

to keep the load in position. The side bearings were extended farther on the original cars, in proportion, than on the model. The eight wheel cars consisted of two trucks such as I have described, connected by the framework or carriage. These trucks were originally made for the purpose of the eight wheel car, and were never made or used for any other purpose. These eight wheel cars, constructed in 1829, were used as occasion required till they were worn out. The new ones are built the same as the old ones, but I am not sure whether the wheels move with the axles or on the axles.

*Int. 4.* Whether or not was the use of these eight wheel cars public and notorious ? and whether or not were they shown and explained to many persons ?

*Ans. to Int. 4.* They were publicly used, and always publicly exposed, never under cover. They were shown to and explained to many persons. At that time a great many railroad committees came there from different sections of the country, and persons interested in building roads, almost every week, and they would call upon Mr. Bryant, and he would show them all over the works and explain every part to them. Crowds of people used to come every pleasant day to visit the railroad.

*Int. 5.* Are you positive as to the date at which said eight-wheel cars were built ? If so, how ?

*Ans. to Int. 5.* I am positive about the date. I left in the spring, perhaps as early as February, 1830, and these were used the year before.

*Int. 6.* What was your duty on the road ? Where was your office, and what occasion had you to see the cars on the road ?

*Ans. to Int. 6.* I was clerk and bookkeeper. I kept all the accounts and paid all the men. My office was situated on the side of the track two thirds of the way between the main road to Quincy and the foot of the inclined plane. I used to go over to see how the men were employed on the road three times a day generally, always twice. I used to see these eight-wheel cars passing and repassing by my office whenever they were in use.

*Int. 7.* Will you state whether there were any sharp curves on the road in the quarry, and how the cars passed them ?

*Ans. to Int. 7.* There was a very sharp curve on the south-east end of the quarry, so that the two trucks stood almost corner to corner, while the load was still resting on the centres.

*Int. 8.* Whether or not did passengers frequently pass on said carriages ?

*Ans. to Int. 8.* When the cars were in use people used frequently to ride both on the trucks and on the carriage or frame. Whenever they had a chance to get on they would jump on and ride.

And in answer to the following cross interrogatories, propounded by C. P. Curtis, Jr., Esq., Solicitor for the Complainant, the said Deponent further depose and saith as follows : —

1 *X Int.* Was steam ever used as a motive power on the Quincy railroad ?

*Ans. to 1 X Int.* Never ; horse power was the only motive power used.



2 *X Int.* Were any cars built or used for passengers?

*Ans. to 2 X Int.* Never.

3 *X Int.* Did any passengers ride on the stone cars for any other purpose than curiosity?

*Ans. to 3 X Int.* Never that I know of.

4 *X Int.* Where was the point of draft of the eight-wheel stone cars you have mentioned?

*Ans. to 4 X Int.* On the centre sill piece of the truck.

5 *X Int.* What was the distance between the two trucks of the eight-wheel car you have described?

*Ans. to 5 X Int.* I should not say it was more than two or three feet. It might have been more.

6 *X Int.* Were not the two trucks so placed that they should just avoid each other on the sharp curves you have mentioned?

*Ans. to 6 X Int.* I am not clear about that. They were set some ways apart, and had to be, in order to carry long stone, like that of the floating dock at Charlestown.

D. R. NASH.

#### DEPOSITION OF NOAH CUMMINGS.

*May 23, A.D. 1853.* And now the said Noah Cummings, having been by me first duly cautioned and sworn to testify the whole truth, did depose and say, in answer to the following interrogatories, propounded by William Whiting, Esq., Solicitor for the Respondents, as follows, namely:—

*Int. 1.* What is your name, age, place of residence, and business? What public offices do you hold?

*Ans. to Int. 1.* My name is Noah Cummings, I am forty-six years of age, I reside in Quincy, Mass. I am Representative to the General Court, and one of the Selectmen of the town.

*Int. 2.* Will you state what you know in relation to the eight-wheel railroad car, on the Quincy Railroad, when it was first made, how constructed?

*Ans. to Int. 2.* The car was put in operation in 1829. I commenced working for the railroad in 1827. It was built and put in operation in the summer of 1829. It was constructed of two solid platform bottoms or bodies, with two trucks to each carriage, and having four wheels each. The model produced and marked G. Bryant I have examined. I should consider it almost a fac simile of the old carriage, as high as I have a recollection of it now. There is not the least doubt in my mind that this is an exact model of the car that was used at that time. The old car that was used there first is worn out by use on the road. Other ones have been built to take its place, and are there now in use. I was connected with the road by working for the company until 1836, and since then I have been engaged in the stone business for myself close by there. The cars pass every day.

The eight-wheel car was built for the purpose of carrying wide stone, as they could not be slung under the four-wheel cars. They were used publicly. At that time it was a curiosity, a new thing, and people used to visit them almost every day, and examine them and see the principle. Mr. Bryant used to have a good deal of company at

that time, and explained it to them. I can't say whether any railroad committees were there, but people from the South came there at several times that I was knowing to. I do not recollect any from other quarters of the country. Great crowds were there frequently, though I can't say where they came from. We used to be frequently annoyed by them.

I don't recollect when the sixteen-wheel car was made, but it was after 1830. I should think about 1831 or 1832. The object of these independent trucks was to turn the curves in the road. There were very short curves in the road, and steep inclined planes.

And in answer to the following cross interrogatories, propounded by C. P. Curtis, Jr., Esq., Solicitor for the Complainant, the said Deponent further deposeth and saith as follows, namely:—

1 *X Int.* Was any other power but horses ever used on the Quincy Granite Railway?

*Ans. to 1 X Int.* No.

2 *X Int.* What was the average rate of speed?

*Ans. to 2 X Int.* Never went over a walk, unless very seldom. About four or five miles an hour, I suppose.

3 *X Int.* Was it not customary to slacken speed round the corners?

*Ans. to 3 X Int.* It was always customary to slacken speed around the curves, for fear the stones would fall off.

4 *X Int.* Was not one object of the eight-wheel and sixteen-wheel car to divide the weight on the rails?

*Ans. to 4 X Int.* I suppose that that was one of the objects. A part of the road was built on piles.

5 *X Int.* Was the Quincy Railroad ever used for any other purpose than to transport stone from a quarry to the River?

*Ans. to 5 X Int.* Nothing more, except to carry lumber from the wharf to the quarry, for the use of the quarry.

NOAH CUMMINGS.

## DEPOSITION OF JOTHAM CUMINGS.

May 23, 1853. And now the said Jotham Cumings, having been by me first duly cautioned and sworn to testify the whole truth, did depose and say, in answer to the following interrogatories, propounded by William Whiting, Esq., Solicitor for the Respondents, as follows, namely:—

*Int. 1.* What is your name, age, place of residence, and business?

*Ans. to Int. 1.* My name is Jotham Cumings, my age is forty-one years, my residence is Quincy, Mass.; my business is repairing the track and making cars on the Quincy Railway. I was first connected with the road in 1828. I did all kinds of work at that time.

*Int. 2.* Will you state what you know in relation to the eight-wheel railroad car on the Quincy Railroad?

*Ans. to Int. 2.* It was put in operation in 1829. The two four-wheel cars or trucks were attached together, to get on wide stone; each truck had four wheels; the two trucks were connected together by a

frame platform and a ring-bolt, on which the trucks swiveled, to conform to the curves on the road; we had short curves, and also to conform to the inclined plane and grades.

The model produced and marked "G. Bryant," is a perfect model of the old cars with eight wheels, as originally built. The first eight-wheel car was worn out on the road in use, and others were built to take their places, and are now in use. These cars were used publicly for any one to see and examine. People used to come from different parts of the country. Mr. Bryant used to explain the machinery and show how it operated. The railroad was a great curiosity in those days.

And in answer to the following cross interrogatories, propounded by C. P. Curtis, Jr., Esq., Solicitor for the Complainant, the said Deponent further deposeseth and saith as follows, namely:—

1 *X Int.* What was the only power used to drag the cars? and what was the average rate of speed?

*Ans. to 1 X Int.* Horse power. The average rate of speed was a walk. The cars would go of themselves down the grades, but horses were attached to them. They run them down frequently without horses, and then I have seen them go as fast as fifteen miles an hour, on a piece of road about two miles long, from the foot of the inclined plane to the wharf, in which part of the road there is one curve; there is a regular grade to the wharf. I have seen this from 1829 up to the present time. I have never seen the eight wheel cars go as fast as fifteen miles an hour. The fastest I have ever seen them go is six or seven miles an hour, having heavy loads. I referred to the four-wheel cars as going at the rate of fifteen miles an hour.

2 *X Int.* Was it not customary to slacken speed round the curves, in carrying stone in the eight-wheel cars?

*Ans. to 2 X Int.* It was.

3 *X Int.* Was the draft of the eight-wheel cars by the carriage or by the truck?

*Ans. to 3 X Int.* By the truck.

4 *X Int.* Was not the eight-wheel car composed of two four-wheel cars connected by a frame beaming?

*Ans. to 4 X Int.* Yes, sir.

JOTHAM CUMINGS.

## DEPOSITION OF JOHN R. ROWELL.

May 31, 1853. And now the said John R. Rowell, having been by me first duly cautioned and sworn, did depose and say, in answer to the following interrogatories, propounded by William Whiting, Esq., Solicitor for the Respondents, as follows, namely:—

*Int. 1.* What is your name, age, business, and place of residence?

*Ans. to Int. 1.* My name is John R. Rowell, I am sixty-three years old, and reside in Salem, New Hampshire.

*Int. 2.* What connection had you with the Quincy Granite Railway; when did it commence and when terminate?

*Ans. to Int. 2.* I commenced in June, 1827, as overseer of all the

business at the wharf of the Quincy Granite Railroad, and remained there till the first of April, 1830.

*Int. 3.* When, if ever, did you see the first eight-wheel railroad car on said rail-road, and whether or not was it in use when you left?

*Ans. to Int. 3.* I saw it in 1829. It was then in use, and used till I went away.

*Int. 4.* Have you examined the model marked "G. Bryant," now before you, and will you state whether or not it is in all respects an exact model of said eight-wheel car?

*Ans. to Int. 4.* I have examined the model, and as nigh as I can judge, it is an exact model of the eight-wheel car that was used there.

JOHN R. ROWELL.

*May 29, 1853.* And now the said John G. Simpson, having been by me first duly cautioned and sworn to testify the truth, did depose and say, in answer to the following interrogatories, propounded by William Whiting, Esq., Solicitor for the Respondents, as follows, namely:—

The Complainant objects to the examination of this witness, on the ground that the name of said witness has not been furnished in any list furnished to the Complainant, according to the statute.

#### DEPOSITION OF JOHN G. SIMPSON.

*Int. 1.* What is your name, age, place of residence, and business?

*Ans. to Int. 1.* My name is John G. Simpson, my age forty-nine, residence Nottingham, New Hampshire, and am a farmer.

*Int. 2.* When, if ever, did you enter the employ of the Quincy Granite Railroad Company, and how long did you remain?

*Ans. to Int. 2.* I commenced in the year 1826, and remained in their employ to the year 1848, when I left.

*Int. 3.* Do you know of any eight-wheel railroad cars known to, and made and invented by Gridley Bryant; if so, when was it made, how long was it used, what became of it?

*Ans. to Int. 3.* I know of such a car; I think they were put on the railroad in 1829. They used them as long as I was in their employ, when we had a heavy stone to move. I helped repair these truck cars very often when the platform planks got rotten. I called on the blacksmith oftentimes to repair iron work to the cars, such as the transient bolts, and the small bolts that fasten the plate down that holds the transient bolts; these used to give out very often. I recollect of one of the axletrees being broken, which was repaired.

*Int. 4.* Will you examine the model marked "G. Bryant," and state whether it is in all respects an exact model of the first car so built with eight wheels?

*Ans. to Int. 4.* I have examined it and taken it apart. I think it is an exact model of the first eight-wheel car that was put on the road.

*Int. 5.* How are you able to be sure that it was in 1829 that the eight wheel car was in use?

*Ans. to Int. 5.* I commenced in 1826. I had charge of a gang of men the third year, I think, after I commenced there. I think that year I helped load these eight-wheel trucks. I think—I have not the least doubt, as to the year in which the eight wheel trucks were introduced.



I have used the word—I think, but I mean I know the fact stated positively.

*Int. 6.* Whether or not do you know of any sixteen-wheel car with two double trucks in use on said road?

*Ans. to Int. 6.* Yes, I think I do. I know we had two eight-wheel cars joined together.

JOHN G. SIMPSON.

## UNITED STATES OF AMERICA.

DISTRICT OF MASSACHUSETTS, ss.

I, Elias Merwin, a Commissioner duly appointed by the Circuit Court of the United States for the District of Massachusetts, under and by virtue of the "Act for the more convenient taking of affidavits and bail, to be used in civil causes depending in the Courts of the United States," passed February 20th, 1812, and the acts in addition thereto, do hereby certify that the time and place for taking the foregoing depositions were agreed upon by the said parties; that on twentieth, twenty-first, twenty-third, twenty-eighth and thirty-first days of August, A.D. eighteen hundred and fifty-three, I was attended by C. P. Curtis, Jr., Esq., Solicitor for the Complainant, by Wm. Whiting, Esq., Solicitor for the Respondents, and by the said witnesses respectively; and each of said witnesses was by me first carefully examined and cautioned and sworn, and the testimony by him given was by me reduced to writing, and was thereafter subscribed by the witness in my presence. And that I am not of counsel or attorney, nor in any way interested in the event of the cause named in the said caption.

ELIAS MERWIN, *U. S. Commissioner.*

## UNITED STATES OF AMERICA.

SOUTHERN DISTRICT OF NEW YORK: CITY, COUNTY AND STATE OF NEW YORK, ss.

*Be it Remembered,* That on this twenty-second day of June, in the year of our Lord one thousand eight hundred and fifty-three, I, Richard E. Stilwell, a Commissioner duly appointed by the Circuit Court of the United States, for the Southern District of New York, in the Second Circuit, under and by virtue of the Acts of Congress, entitled "An Act for the more convenient taking of affidavits and bail in civil causes, depending in the Courts of the United States," passed February 20th, 1812, and the Act of Congress, entitled "An Act, in addition to an Act, entitled 'An Act for the more convenient taking of affidavits and bail in civil causes, depending in the Courts of the United States,'" passed March 1st, 1817, and the Act entitled "An Act to establish the Judicial Courts of the United States," passed September 24th, 1789, did call and cause to be and personally appear before me, at my office, at the new City-Hall, in the City of New York, in the said Southern District of New York, in the State aforesaid, Horatio Allen, to testify and the truth to say, on the part and behalf of the Defendant, in a certain suit or matter of controversy, now depending and undetermined, in the Cir-

cuit Court of the United States, for the District of Massachusetts, wherein Ross Winans is Plaintiff, and the Eastern Railroad Company [?]. And the said Horatio Allen, being about the age of [?] years, and having been by me first cautioned and sworn to testify the truth, the whole truth, and nothing but the truth, in the matter of controversy aforesaid, I did carefully examine the said Horatio Allen, and he did thereupon depose, testify, and say as follows, viz:

## DEPOSITION OF HORATIO ALLEN.

Q. 1. What is your name, age, place of business, occupation, and what firm do you belong to?

A. 1. My name is Horatio Allen, fifty-two years of age, place of business New York, engineer by profession, and a member of the firm of Stillman Allen & Co., of the Novelty Iron Works, New York.

Q. 2. When, if ever, did you become the engineer of the South Carolina Railroad, and whether, in the month of November, 1829, you made any report—and if so, what—to the President and Directors of said Company?

Question objected to, on the ground that any report made by witness in 1829, unless the Plaintiff was a party thereto, cannot be given in evidence in this suit.

A. 2. I became engineer of said railroad in 1829, I think in October or November; I can't say as to that now; I do not recollect.

Q. 3. Whether or not, at the time you became engineer as aforesaid, were there any four-wheeled steam carriages in use on the said road? and whether or not did you then begin to investigate and mature any plan for increasing their size and capacity, for giving them a proper number of bearing points on the rails, and the requisite ease of motion to make them run steadily, and conform to the vertical and horizontal inequalities of the road? if so, will you state the plans you proposed?

A. 3. There were no steam carriages in use on the road; when I commenced, there was no railroad built.

Q. 4. Will you state what you recollect as to the steam carriages first used on said road, and what improvements, if any, you proposed to make, and what you did make?

A. 4. The steam carriages first used were four-wheeled carriages; I became satisfied, during the season of 1830, that it would be necessary to place our steam carriages on six or eight wheels, and devised the means of adapting the carriage to six or eight wheels.

Q. 5. Whether or not did you communicate your views on this subject to any person or corporation; and if so, was said communication written or printed, and when was it written or printed?

A. 5. The communication was made in writing, in the spring of 1831, to the President and Directors of the South Carolina Railroad Co., and it was subsequently printed in the same year. The date of the report is May 16, 1831.

Q. 6. Have you in your hands one of the printed copies thereof. If so, will you annex a true copy of so much thereof as relates to this subject.

Question objected to, upon the ground that the copy referred to by

the witness, not being in his hand writing, and the original not being accounted for, the same is not evidence; and, *secondly*, that a mutilation or extract from said report is not admissible.

Question withdrawn.

Q. 7. Have you the original printed report in your hands? can you annex the same to your answer; and, if not, why can you not do so; and will you prepare a true copy thereof, and annex said copy to your answer?

Question objected to, upon the ground that the printed copy is not evidence, not being in the witness' hand writing, and the original not being accounted for.

A. 7. I have the original printed report in my hands. I cannot annex the same to my answer. I cannot annex it, because it is not under my control. I will prepare a true copy thereof, and annex the same to my answer.

Q. 8. Whether or not, according to the best of your knowledge and belief, is the original written report from which the said printed report was copied, lost or destroyed? and is the said printed report a true copy of the original written report? and is the copy you annex a true copy of the said printed report? and if the original written report is still in existence, is it in your possession or control?

A. 8. I think it is not lost or destroyed; I believe the printed report is a true copy of the original written report. The copy I am to annex will be a true copy of the printed report. The original written report is not in my possession or control.

Q. 9. Will you state when your plans for the improvement of the steam carriage were matured in your mind, as to the principles of construction and operation?

A. 9. I should think during the last months of 1830.

Q. 10. Whether were your plans carried into effect, and when was it?

A. 10. They were carried into effect in the year 1831.

Q. 11. What were those plans? Whether or not were they drawn by any engineer? If so, by whom, and when?

A. 11. Those plans were the plans of an eight wheel engine. I gave each four wheels, at either end of the engine, an independent frame or truck. I connected the centre of that frame or truck with the boiler of the locomotive, by a centre pin, and I supported each end of the boiler, by rollers resting on the sides of the truck, about midway between the pair of wheels, commonly called side bearings. This arrangement allowed each truck or frame to move horizontally around the pin, and allowed each frame to move vertically around the point at which the boiler rested around that frame or truck.

Adjourned to 10 A. M. 23d June.

June 23d, 1853. Parties present, examination continued. The plans were drawn by an engineer; that engineer was C. E. Detmold, I think in the winter of 1829 or 1830. I think it was in the close of the year 1830.

Q. 12. Whether or not are the original plans and drawings of the steam carriage testified of by you, in your last answer now before you? and will you annex the same, or a true copy thereof, to your answer?

and if you have no right to annex the original drawings, state why you cannot do so.

A. 12. The said original plans and drawings are before me.

The counsel for the Plaintiff now requests that the said original plans and drawings may be marked as Exhibits by the Commissioner.

The counsel for the Defendant thereupon consents that the said plans and drawings referred to, which are marked capital H and G, shall be signed by the Commissioner, for the purpose of identifying the same hereafter, but objects to the originals being made Exhibits in this case, as they are already made Exhibits in another case now pending in the Circuit Court of the United States, in the State of New York, and are identified by the signatures of a number of subscribing witnesses, and are a necessary part of their testimony in said case; but the counsel desires that exact copies of the same shall be annexed by the witness.

Witness continues—I will annex them if I can have these to make a true copy of. I cannot annex the original, because they are not under my control.

The counsel for the Plaintiff now requests the Commissioner to take possession of said Exhibits G and H, and to file each of said Exhibits with the testimony of the witness.

The Commissioner declines to comply with the request, as above stated.

Q. 13. Will you examine the model now before you, and state whether it is, or is not, in all respects, a true model of the said steam carriage?

A. 13. It is, sir, a true model.

Q. 14. Will you state what connexion you had with the railroads in this country, in the early periods of their history?

A. 14. I was connected with the [?] railroad of this country, in its earliest movement, as an engineer.

Q. 15. What railroad was you first connected with, and when?

A. 15. With the railroad connected with the Delaware and Hudson Canal Co., in 1827 or 1828.

Q. 16. When was the first railroad iron imported in this country, so far as you know, where was it used, who contracted for it, and sent it home?

A. 16. In 1828; it was used on the railroad of the Delaware and Hudson Canal Co. I contracted for it and sent it home.

Q. 17. Who contracted for, and imported the first railroad engine used in this country, when and where was it used?

A. 17. I contracted for it. The Delaware and Hudson Canal Co. imported it and it was used upon their railroad.

Q. 18. Who was the first man that rode upon and conducted the first railroad steam engine imported into this country, when and where?

A. 18. I was the first man, and it was on the first locomotive used by the Delaware and Hudson Canal Co., used upon their railway in Pennsylvania.

Q. 19. Whether or not did you have occasion to pay attention to the improvement of carriages for railway conveyance, and for how many years were you connected with railroads?



A. 19. I did have occasion. I have been connected with railways over 20 years.

Q. 20. How many railways have you been connected with? give the names of some of the leading ones.

A. 20. Four, five or six; Delaware and Hudson Canal Co's. road, South Carolina Railroad, New York and Erie Rail Road, Panama Railroad.

Q. 21. What connection had you with any other public works? Will you state what they were, and what you had to do with them?

A. 21. The Delaware and Hudson Canal, the Chesapeake and Delaware Canal, Croton Aqueduct. I was engineer with them.

Q. 22. Had you any connection with the dry dock?

A. 22. I had connection with the Sectional Dry Dock, as applied to naval purposes.

Q. 23. Are you familiar with the principles of mechanics as applied to machinery?

A. 23. Yes.

Q. 24. Whether or not is it your constant business to examine mechanical principles of machinery?

A. 24. Yes, sir.

Q. 25. Have you examined Winan's patent for the eight wheeled railroad car, dated Oct. 1st, 1834, and are you familiar with the principles of its construction?

A. 25. I have examined it, and I have a general recollection of the principles of it.

Q. 26. So far as relates to the running part of said Winan's car, and its connection with the body of said car, will you state whether or not said Winan's car is constructed and operated upon the same mechanical principles as the running part of your said steam engine?

A. 26. I do not know what Winan's car is, except as set forth in the patent referred to; and from my recollection of that instrument, the mechanical arrangements in reference to the points named, are essentially the same.

Q. 27. When, where and by whom was the first railway steam engine made, according to your plans and drawings? when was it first put into operation, and where?

A. 27. In the year 1831, in the city of New York, West Point Foundry Co.; in the early part of the year 1832, at Charleston, in South Carolina; the work was begun in June or July, 1831.

Q. 28. Whether or not were other, and how many engines subsequently built and put in operation on said road, constructed in said manner?

A. 28. Yes. Three others.

Q. 29. When?

A. 29. In the year following.

Q. 30. Will you explain how the running part of these engines operated, and what if any advantages they had over the ordinary running parts?

A. 30. Perfectly well. Can't make that comparison. There were no ordinary running parts to compare with them. The eight-wheeled arrangement required a special adaptation for curvatures and vertical inequalities of line, not called for in the four-wheel engine. The

arrangements then introduced by me for those objects provided that adaptation perfectly. By providing the means, which allowed each truck at the end of the locomotive to move horizontally around the central pin by which the truck was permanently connected with the locomotive, and by providing a support of the locomotive by side bearings about half way between the wheels.

Q. 31. What effect, if any, had this arrangement of the running part upon the evenness and smoothness of the passage of the carriage while in operation?

A. 31. It gave great ease and smoothness of operation, far beyond what was attainable in any four-wheeled car.

Q. 32. Whether or not were these eight-wheel steam carriages constructed and operated upon the same substantial combination of two four-wheel bearing carriages with rigid rectangular frames, and pedestals and springs, bolster and centre-pivots, and side bearings, supporting a long body, and conforming to the curves and other inequalities of the road, as the eight-wheel passenger and freight carriages now extensively used on the railroads of this country. If not, what substantial difference exists between them?

Question objected to upon the ground that the same is a leading question and therefore improper.

This being an objection to mere form, the question is waived.

Q. 33. Are you acquainted with the eight-wheel double truck railroad passenger car now in general use in the United States? If so, will you state whether or not, there is any substantial difference in the mechanical principles on which they are constructed and operated, from those which are embodied in your aforesaid steam carriage?

A. 33. Yes; in their adaptation to passing curves, and providing for inequalities in the surface of the road, they are essentially the same.

Q. 34. Whether or not, after maturing your plan of the engine, as above stated by you, did you or not lose any time in prosecuting the same to a successful practical use on the said railroad?

A. 34. I did not.

Q. 35. Whether or not, in your opinion, if a car-body were substituted in place of your boilers, on your steam carriage, would or would not the said car be substantially like those generally used on the railroads of the United States, so far as relates to their adaptation to passing curves and inequalities of the road, and smoothness, and evenness, and rapidity of travelling; and would it, or not, require invention to make such substitution?

Question objected to, upon the ground that the same is a leading question, and therefore improper.

A. 35. To the first branch of the question, Yes; and to the second, No.

Q. 36. Have you, or not, any interest in this suit, or in the subject of it?

A. 36. No.

Q. 37. Have you examined the model of the Quincy car now shown to you, and marked G. Bryant, and will you state whether or not this car is constructed and operated, so far as relates to the running part, and its connection with the body, upon the same mechanical principles as the eight-wheel cars in general use in the United States?

A. 37. I have examined the model marked G. Bryant; I have no knowledge whether that is the Quincy car or not; it embraces the main features of the usual eight-wheel car, having two independent trucks.  
HORATIO ALLEN.

CROSS-EXAMINED by Mr. Sickles, as counsel for Plaintiff.

Q. 1. How long were you connected with the South Carolina Railroad, as engineer, or in any other way; that is, up to and including what years, as near as you can now recollect?

A. 1. Some five years, to the spring of 1835; it was solely as engineer; I was its chief engineer during the whole period.

Q. 2. During the time that you were chief engineer, were there any freight or passenger cars, or carriages, built for said railroad? if you answer yes, say whether they were built under your direction, or some other person, and where and when the first passenger or freight car was built, as near as you can recollect?

A. 2. Yes; they were built in the city of Charleston, in the year 1830, I think.

Q. 3. Were there any of the kind of cars mentioned in the last question, built under your direction after 1830?

A. 3. Yes.

Q. 4. Will you state at what time, as near as you can recollect, the last passenger and freight cars were built, to be used on said road, under your direction?

A. 4. I have no recollection as to time.

Q. 5. Will you describe, as accurately as you can, the length and general construction of the first passenger car used on said road?

A. 5. They were four-wheel cars, about twenty to twenty-five feet long; I speak from recollection only.

Q. 6. Were there, during the time that you were engineer on said road, any other description of passenger car built, except the four-wheel car mentioned in your last answer?

A. 6. I think not.

Q. 7. In answer to cross-question 2d, you have said that there were freight cars built to be used on said road, in the year 1830; will you state whether there were any freight cars built for said road under your direction after 1830, and up to what period of time?

A. 7. There were after 1830, and I suppose up to the time of my leaving the road; I have no recollection as to time.

Q. 8. Will you now describe the kind of car which was used to carry freight, during the period of time referred to in your last answer?

A. 8. They were four-wheel cars, the frame resting on two axles.

Q. 9. As nearly as you can now recollect, how many four-wheel steam carriages were erected and used on said road, during your official action as chief engineer?

A. 9. I think four; there might have been more.

Q. 10. In your answer to direct question *four*, you say that you became satisfied that it would be necessary to place the steam carriages on six or eight wheels, and that you devised the means of adapting the

carriage for six or eight wheels; will you state what adaptation was made for six wheels?

A. 10. By using one truck with four-wheels, as already described in the eight-wheel arrangement, and connecting the other pair of wheels, and their axle, with the main frame of the locomotive.

Q. 11. Did you construct a locomotive, or more than one, to be used on said road, with six wheels?

A. 11. I altered one four-wheel English engine to a six-wheel arrangement.

Q. 12. When?

A. 12. I don't know.

Q. 13. Try and recollect the year.

A. 13. I can't recollect; I can make an inference about the time it must have been.

Q. 14. How long was the six-wheel engine used, as near as you can recollect?

A. 14. My recollection is, that it was in use until I left the road; I have no definite knowledge about it.

Q. 15. Do you recollect the length of the six-wheel engine; and if yea, please to state the length?

A. 15. I do not recollect.

Q. 16. You have referred to having communicated your views on the subject of the six and eight-wheel steam carriages, to the President and Directors of the South Carolina Railroad; can you now produce, to be marked as an Exhibit, the communication made by you referred to?

A. 16. I cannot.

Q. 17. Why not?

A. 17. I have not a copy.

Q. 18. Can you now report verbatim, without such report being before you, the views expressed by you in said report?

A. 18. No.

Q. 19. You have said, in answer to direct question *four*, that the report so made is dated May 16, 1831; in what way do you recollect the date?

A. 19. From the date of the printed report, and I have no doubt that is correct.

Q. 20. Can you now produce, and mark as an Exhibit, a copy of said original report, which has been compared by you with the original report, and which you know, from having compared the original with the copy, to be correct?

A. 20. What do you mean by now; for the purposes of this trial, or the present moment? [The counsel answers that the question relates to the present moment, and requests an answer.] Whereupon the witness answers—No, I cannot.

Q. 21. In answer to direct question seven, you say, "I have the original printed report in my hand;" do you mean to say that you have compared that copy of the printed report with your original written report?

A. 21. No, sir.

Q. 22. In answer to question seven, you say, I will prepare a true copy of said report, and annex the same to my answer; have you



prepared any copy, and if yea, have you compared such copy with the original report referred to in your own handwriting?

A. 22. No.

Q. 23. In your answer to direct question 8, you say that you think that the original report is not lost or destroyed, and that you believe the printed report to which you have referred in your direct examination, is a true copy of the original. Do you mean to swear that you have compared the printed paper referred to with the original report.

A. 23. I do not mean to swear to that.

Q. 24. Have you searched for the original report referred to, as originally made to said President and Directors of said road?

A. 24. That original report, I suppose, is in the hands of the President and Directors of the Company, and I have not made any attempt to obtain it.

Q. 25. In answer to direct question 9, you say, "I should think, during the last months of 1830, the plans for the steam carriage were matured in my mind;" explain what you mean by maturity of mind.

A. 25. I speak of maturity of plan, and not of maturity of mind.

Q. 26. Will you state, as fully as is convenient to you, what you mean by maturity of plan?

A. 26. I mean the essential features of the arrangement were determined on.

Q. 27. Were those essential features either reduced to writing or placed upon a drawing, or made upon a model; and, if either, when first?

A. 27. They were represented in a drawing, and nothing else; I think in the last months of the year 1830.

Q. 28. Have you any date, made at the time, which you can produce, either to refresh your memory, or to show which of the last months in the year '30 you made said drawing?

A. 28. No.

Q. 29. Is it not possible, if you have no memoranda, that you may be mistaken in the time?

A. 29. Yes.

Q. 30. In answer to direct question ten, you say "that your plans were carried into effect in the year 1831;" will you please to state when, and in what month, in the year 1831?

A. 30. The plans were prepared in the year 1831, and it may be the latter part of 1830; the work was executed in the summer of 1831; the contract made probably in June, 1831.

Q. 31. Have you any memoranda at this time in your possession, which you can produce, to show that the plans you referred to were prepared in the year 1831, or the year 1830, or that the work was executed in the summer of 1831? please to state all the facts as fully as you can.

A. 31. I have, as to the first part; as to the second, I have not.

Q. 32. Will you be more explicit, and state [?] by "I have as to the first part?"

A. 32. I mean as to the first of the two questions.

Q. 33. The first branch of the question speaks of the year 1831, and also of the year 1830, and asks whether you have any memoranda

at this time in your possession, which you can produce, to show that the plans you refer [?] were prepared in the year 1831, or the year 1830; please to state which of the years you refer to.

A. 33. I cannot say; I have said the plans were prepared at the close of 1830, or the beginning of the year 1831; I cannot tell which.

Q. 34. Can you produce any memoranda, made by yourself, to show either of the years referred to?

A. 34. No.

Q. 35. You have said, in answer to question eleven, you say those plans were a plan of an eight-wheel engine; will you be good enough now to state the length of that engine, the height of the wheels, if the wheels were of the same diameter, or if they differed, in what way, and upon what part of the frame—if the locomotive had a frame—the engine rested?

A. 35. I don't recollect; four of the wheels were five feet; and four, I think, were three feet; the cylinder of the engine was attached to the boilers.

Q. 36. Can you recollect the length of the boilers, and whether, including the cylinder and the fire-boxes, the platform was covered by said boilers and cylinder, and fire-box, or otherwise? please state all the facts.

A. 36. I do not recollect the length of the boiler; the frames or trucks was [?] covered by the boilers; by frame I mean the truck; there was no independent frame; the boilers constituted the frame.

Q. 37. Will you state in what manner the locomotive was drawn, whether from the end of each truck, or from the end of the boiler?

A. 37. From the end of the truck.

Q. 38. The preceding question was intended to relate to the manner in which the locomotive in question was connected with a freight or passenger car, and in what way the freight or passenger car was connected with the locomotive, by the truck of the locomotive or otherwise.

A. 38. Connected with the truck.

Adjourned to 9 1-2 to-morrow morning.

Adjourned to 11 1-2, A. M., the 25th June.

*June 25th, 1853.*—Parties present. Cross-examination continued.

Q. 39. Will you state the distance from the centre of each axle of the passenger and freight cars used on the South Carolina road, while you were engineer, as nearly as you can now recollect? and, if any changes were made during the period you refer to, you will state what changes.

A. 39. I don't recollect, with any accuracy; ten or twelve feet, I should think.

Q. 40. Will you be good enough to say whether your last answer is intended to refer to both the passenger and freight cars; and whether, as nearly as you can now recollect, the distance referred to was either ten or twelve feet; state which of the distances you will adopt?

A. 40. To both? I cannot adopt either; my recollection is entirely indefinite.

Q. 41. In answer to direct question thirteen, you have answered that a model which is marked "Horatio Allen, Defendant's Exhibit," is, in all respects, a true model of the South Carolina engine; will you be good enough to state upon what rule, a foot, the model is constructed?

A. 41. It is a true model in reference to all the parts that it is a model of; the model referred to is two inches to the foot.

Q. 42. Will you now measure the distance from the end of the frame of one of the trucks of said model, to the periphery of the rear wheel thereof, and state the distance thereto in feet?

A. 42. About fifteen inches.

Q. 43. Will you measure the distance from the same end of the frame to the periphery of the forward wheel?

A. 43. About five feet three inches.

Q. 44. What is the diameter of the forward wheel?

A. 44. Five feet.

Q. 45. Will you now state the distance from the end of said truck to the extreme outside tread of the forward wheel?

A. 45. About ten feet three inches.

Q. 46. Are both the trucks made in the same proportion as the one you have measured?

A. 46. Yes.

Q. 47. From the tread of the forward wheel of the truck first measured, to the tread of the nearest wheel on the second truck, what is the distance in feet?

A. 47. About fifteen inches.

Q. 48. Will you now measure the whole length of the model referred to, and state what was the length of the locomotive?

A. 48. Nearly twenty-two feet; about twenty-one feet nine inches.

Q. 49. In answer to question 15, you have said that you were connected with the Delaware and Hudson Canal Co., in '27 and '28, and in answer to question 20, you have stated you were connected with four, five, or six different railways. If perfectly convenient, and your memory serves, will you name the different railways, when each commenced or terminated the year that you commenced your connection with each one, and how long you continued?

A. 49. On the Delaware and Hudson Canal Co., from Honesdale to Carbondale, in parts of the years '27 and '28. The South Carolina Railroad, from Charleston to Augusta, from '29 to '35. New York and Erie Railroad, from New York to Dunkirk, from, I think it was from '42 to '43, with one or two short omissions, up to '51 or '52; Panama Railroad, from Atlantic to Pacific, during parts of 1850 to 1851, I think. I have been consulted in regard to other roads, which it is not worth while to mention.

Q. 50. Were there any cars, either freight or passenger cars, used in connection with the Delaware and Hudson Canal Co., between Honesdale and Carbondale, during the time you acted as engineer?

A. 50. There were freight cars.

Q. 51. Will you state whether the freight cars you refer to were four wheel cars or otherwise, and the length thereof?

A. 51. They were four wheel cars; I do not recollect the length.

Q. 52. Can you now recollect the length of the cars which were

used for passenger cars, and conveying freight, on the South Carolina road, during your administration as engineer thereof?

A. 52. I do not recollect.

Q. 53. Can you now recollect the distance, from centre to centre, of the axles of the passenger cars, or if there was any variation, what variation in the distance?

A. 53. I have already said I cannot recollect.

Q. 54. Will you try and approximate to the distance, as nigh as your memory will now serve?

A. 54. I have already said, I think from ten to twelve feet, perhaps from about eight to twelve would be more correct.

Q. 55. Can you now recollect the distance, from centre to centre, of the axles of the freight cars in use, during your administration as engineer on said road, upon said South Carolina road, and if any variation was made in the distance, what variation? State the facts as accurately as you can now recollect?

A. 56. I have already said I cannot recollect.

Q. 57. In answer to question 25, you have said that you have examined Winan's patent for the eight wheel railroad car, dated Oct. 1, 1834, and that you have a general recollection of the principles of that patent. Will you be good enough to favor the Commissioner with your view of the word principle, as you intend to apply it to that patent?

A. 57. I mean that which determines the character of the arrangements by which the car is adapted to the objects in view.

Q. 58. What do you understand to be the object contemplated by Mr. Winans in that patent?

A. 58. To enable the car upon eight wheels to pass through the curvatures and over the inequalities of railroads, with ease, smoothness, and without injurious strain upon the structure of the car.

Q. 59. Will you now state, as nearly as you can recollect, the manner in which Mr. Winans proposes to construct the car mentioned in such specification, using as near as you can now recollect, the words of Winans, in relation to carrying out his said invention?

A. 59. I have no recollection of his words at all. I can describe the manner, according to my recollection. To each four wheels, at either end of his car, there is a frame, by a central pin; that frame was connected to the main frame of the car, the car being supported by means of two pieces, one attached to the main frame of the car, and the other attached to the frame of the four wheels, and so formed, on their touching surfaces, as to allow, within certain limits, the movement of the frame of the four wheels in any direction under the main frame of the car. The two axles of the four wheels were attached to the opposite ends of a pair of springs, which were fastened to the frame of the four wheels referred to. He proposes to put the frames of the four wheels near the ends of the main frame of the car.

Q. 60. Can you now recollect what Mr. Winans does not claim in said specifications, repeating, as near or as nearly as you can now recollect, what he does not claim in his said specification?

A. 60. I do not recollect.

Q. 61. Can you now state what Mr. Winans does claim in his said specification, and for which he asked a patent?



A. 61. As near as I can recollect, he claims substantially the arrangement as I have now described.

Q. 62. Have you stated all that you recollect of the general description contained in the patent of Winans, and the claim connected therewith? If yea, will you so state, or if you wish to add anything further, will you add it now?

A. 62. I don't wish to add anything.

Q. 63. As an engineer, what do you conceive to be necessary to the proper construction of an eight wheel passenger or freight car, as at present in use, having in view the advantages of safety and economy? Will you give your views as fully as may be convenient?

A. 63. I do not understand the question.

Q. 64. Suppose, as an engineer, that you were requested to adapt an eight wheel car to a railroad already constructed, in what way would you direct the eight wheel car to be made, so as to conform to the lines and curvatures of said road, keeping in view the advantages of safety to passengers, and economy in operating said car?

A. 64. I would build it with four wheel trucks, on which the main frame would rest by side bearings, and to connect which, I would connect the main frame, by a central pin, and I would provide for preserving the parallelism of the axles of each four wheel truck, under all circumstances.

Q. 65. Is there any leading feature about a railroad, which regulates the distance between the trucks, and also the length of the body of the car, or otherwise? Please to state your experience connected therewith?

A. 65. The greater the radius of curvature upon the road, the farther apart you can have your trucks. But as roads are usually built, the room required for passengers or freight, determines the length of the car. The truck frame should be placed near the ends of the car.

Q. 66. Suppose a passenger car should be constructed with two trucks, each of four wheels, and instead of each truck being placed near the end of the car, as you have described, that the car should be divided into four parts, two parts of which should be a space between the peripheries of the wheels of the trucks, and the remaining two parts should be appropriated to the trucks, as shown in the drawing now handed to you? Will you state whether a car, constructed after the drawing here shown, would be an eight wheel car, as at present used, or if it differs, in what particulars it differs, in your opinion, from an eight wheel passenger car.

Question objected to by defendants' counsel, because in the drawing exhibited to the witness, it is not true that two parts of the length of the body is between the peripheries of the wheels of the trucks. The length of the body measuring seventeen inches and a half, two parts of which is eight inches and three-quarters, while the distance between the peripheries of the wheels of the two trucks, is four inches and a half only, and not as the question implies, of eight inches and three-quarters.

The counsel for the plaintiff desires to explain the question objected to, by correcting the words "between the peripheries of the wheels of the trucks," and substituting therefor the words "the bolsters which rest upon the trucks," and asks the gentleman who makes the objec-

tion, to measure the distance between the bolsters, and let the witness say whether the distance between said bolsters, is not an approximation towards two parts of the length of the body, as shown upon said drawing.

The counsel for the Defendant replies, that the gentleman who makes the objection, is happy to consent to make the measurement, and allow the witness to answer any question that may be asked him.

A. 66. I consider the trucks, as represented in the drawing, sufficiently near the ends of the car, to come within my description of near the end of the car. The drawing is too incomplete to make a comparison.

Q. 67. Will you now again look at the said drawing, incomplete as it may be, and say whether the trucks, as shown upon the drawing, if placed nearer to each end of the body, and the draft were from each end of the body, it would or would not approximate nearer to the eight-wheel passenger car at present in use, and whether, if constructed as suggested, the alteration would or not be an improvement in the ease and smoothness of the running of the car?

A. 67. I say yes to both.

Adjourned to Monday the 27th, at 10 1-2.

*Monday the 27th, 1853.* Parties present—Cross examination resumed.

Q. 68. In answer to direct question 14 you have said that you were connected with the railroads of this country, as an engineer, in its earliest movement. Will you state what was the situation of the science of engineering, as applied to railroads, in the earliest movements connected therewith?

A. 68. The science of engineering was prepared to welcome a new mode of transportation and conveyance, and develop them as rapidly as possible.

Q. 69. In the rapid development of the science of engineering, as applied to railroads, have you a recollection of any event which occurred either in Europe or in this country, and either before or after your connection with the Delaware and Hudson Canal and the South Carolina Railroad, which awakened the public mind to the prospective utility of railroads? If such an event is within your mind, you will please to state it, and the year, as near as you can now recollect.

A. 69. I have a recollection, both before and after. The operations on the Stockton and Darlington road, prior to 1827. The determination to build the Liverpool and Manchester road, prior to 1827. The great locomotive competition, in 1829 or 1830. I can't recall the date.

Q. 70. Do you recollect at this time, the year in which the Liverpool and Manchester road, was opened for use, and whether such opening occurred in either of the years named by you in answer 69.

A. 70. I do not recollect the year when the road was opened.

Q. 71. Did not the opening of the Liverpool and Manchester road, more than any event which occurred about that time, stimulate the enterprise of this country to push on the railway projects already in contemplation?

A. 71. Yes.

Q. 72. During your administration, as engineer upon the several roads you have named, did you cause to be constructed any eight-

wheel passenger or freight cars? If you answer yes, name the road, the year; and, as near as you can now recollect, will you furnish a description of the length of said cars, and each of them, the manner of constructing the trucks, the approximation of the trucks to each end of the car or cars, and the distance between the tread of the wheels of each truck?

A. 72. Yes, upon the New York and Erie road, and upon the Panama road. On the New York and Erie road, between the years 1843 and 1851; and on the Panama road, in the year 1851, I think. I do not recollect the length of cars. Each truck was supported by two axles, with four wheels, each axle was preserved in its parallelism with the other by such a connection between the axle and the frame, as only allowed the frame to move up and down on the spring, in a vertical line, when the car was upon a horizontal piece of road. The frame, carrying the axles as described, was connected with the main frame by a central pin. The weight was supported by side bearings resting on the truck. The trucks were near the end of the car. The wheels were from six inches to twelve or fifteen apart. I have no distinct recollection as to the distances between the axles in the trucks. This applies to the passenger and freight cars on the Erie road, and to the passenger cars on the Panama road.

Q. 73. In the construction of the eight-wheel cars referred to upon either road, were the wheels in the trucks and each of them of a uniform height, or did the wheels vary in height; and if so, how much did they vary?

A. 73. The wheels in the same truck were of the same height; sometimes the truck wheels were thirty inches, and thirty-six.

Q. 74. Can you now recollect with any accuracy, the length of the radius of the shortest curvature upon the New York and Erie road; that is, so far as the same were constructed under your administration as engineer?

A. 74. There was one case, a little under a thousand feet. I do not recollect precisely how much.

Q. 75. The same question as applied to the Panama road.

A. 75. I do not recollect.

Q. 76. In answer to cross-question 65, you have said the greater the radius of curvature, the greater may be the distance between the centres of the axles of the trucks. Were the passenger and freight cars upon the New York and Erie, and the passenger cars upon the Panama, constructed to correspond with the shortest radius of curvature upon each of said roads? If you answer yes, will you state whether the distance between the treads of the wheels upon the trucks on the Erie road, correspond in your opinion with the radius of the shortest curve?

A. 76. They were constructed to pass the curvatures with ease and without objection.

Q. 77. Are there any advantages to railroad companies, to passengers or to forwarders, obtained by using the eight-wheel double truck car, over the ordinary four-wheel car, such as you caused to be constructed and had in use upon the South Carolina road, during the time that you acted as engineer thereof? If you answer yes, be good enough to state consecutively the several advantages.

A. 77. Yes, there are advantages; they consist mainly in being able

to place more passengers and freight in one car, and thus reduce the number of cars, and the weight of carrying structure in proportion to what is carried.

Q. 78. In constructing four-wheel cars, is it not equally essential to arrange the distance between the centres of the axles, for the purpose of passing the shortest curvature?

A. 78. Yes.

Q. 79. Suppose that the shortest radius of curvature was four hundred feet, and four wheel cars were used, of the length of those spoken of by you, on the South Carolina road, to wit., of twenty to twenty-five feet in length, and the axles were placed, that is, from centre to centre, in such a position, on said cars, and each of them, as to pass a curvature with a radius of four hundred feet, with a speed of twenty miles an hour, would there be no other advantage in the eight-wheel car except those detailed in answer to question 77? Please to state fully.

A. 79. The advantages devolve themselves mainly in my previous answer, as described in answer 77.

Q. 80.

HORATIO ALLEN.

*Direct resumed, by Respondents' counsel.*

Q. 1. In reference to your statement, in connection with the plans of your steam carriage, will you now state whether the two plans, marked G and H, now produced by you, are the copies referred to in your answer? are or are not they true copies, and will you now hand them to the Commissioner, to be annexed to your answer, and will you sign them, so as to identify the same?

Question objected to, upon the ground, first, that the originals have been referred to by the witness, as being in the presence of the examiner, and the originals only can be marked as an Exhibit. Secondly, that the counsel for the Plaintiff, after witness, in answer to direct question 12, had stated that "the original plans and drawings are before me." The counsel for the Plaintiff requested that said original plans and drawings may be marked as an Exhibit, and that the counsel for the Defendant consented to the same. Thirdly; that no other than such original plans can be used, as they are the best evidence.

The counsel for the Respondent denies having consented to have said original plans marked or used as an Exhibit in this case, but expressly declined so to do, and gave his reason therefor; which refusal and reasons were, at the time they were given, recorded by the Commissioner, in this deposition; but he did consent, and still consents, that said original plans should be signed by the Commissioner, for the purpose of identification and future comparison thereof, with the copies now produced.

A. 1. These are true copies of the same, and signed by me, and handed to be annexed to my testimony.

Q. 2. Will you explain whether the connecting rod on the drawing, was or was not attached to the crank on the main axle, with ball joints, or other equivalent, to allow the trucks to swivel and conform to the curves of the road, and did or did not such connection allow the trucks freely to conform to the curves of the road?



Question objected to, upon the ground, 1st, that no question is admissible, connected with said drawings, or any part thereof, as the originals have not been marked. 2d, the witness' direct examination has been exhausted, and, therefore, the question is improper.

A. 2. They were so made, and did so allow.

Q. 3. Will you please to mark on said plan with the letter X, any ball-joint or other equivalent, by which to show the position of the connection between the main axle and the connecting rod?

Same objection as to the preceding question.

A. 3. I have so marked the plan.

Q. 4. Have you handed to the Commissioner a copy of the report referred to in your former answer? Have you compared the same with the copy thereof, printed and published in the year 1831, and is the said copy a true copy thereof?

Question objected to, upon the ground that upon the counsel proposing direct question 6, that question was objected to, because the copy report referred to in the question, was not the original report, nor in the witness' hand writing, and the original not accounted for, and the objection is now renewed, to the introduction of a copy [of a copy?] of said pretended report.

A. 4. I have not. (The witness now hands the Commissioner a paper.) I have, I have compared it, and it is a true copy thereof.

Q. 5. You have been asked whether you have any memorandum that you can produce, by aid of which you know that it was in the last month of 1830, or the beginning of 1831, that the original drawings mentioned in your answer were made by C. E. Detmold, whether or not are you enabled, without the aid of memoranda, which you have now the power of producing here, at this time and place, to fix the time at which you have stated said drawings to have been made, by means of various facts and circumstances connected with this subject?

Question objected to, upon the ground that as said original plans and drawings have not been marked as Exhibits, and placed in the hands of the Commissioner, each and every enquiry connected therewith, is improper.

A. 5. I am enabled so to fix the time.

Q. 6. In your answer to the 59th question, you state "the two axles of the four wheels were attached to the opposite ends of a pair of springs, which were fastened to the frame of the four wheels referred to." Would or would not your answer more correctly describe the car specially described and recommended in said patent, by substituting the word bolster, instead of the word frame?

Question objected to, upon the ground that the counsel for the Defendant, having produced the witness, and having laid the foundation of cross interrogatory 59, the answer to which contains the language quoted, the question is improper, because the counsel has no right to cross-examine his own witness.

A. 6. I think it would.

Q. 7. Whether or not, in your opinion as an engineer, would a railroad car, constructed with springs and bolsters, the end of said springs being bolted to boxes, in which the axles of the wheels should run, in the manner stated in said Winan's patent, be a safe and practically

useful mode of constructing eight wheel railroad passenger or freight cars?

A. 7. The safety would depend upon the stiffness of the springs, and the manner of its connection with the bolster. I should not think it an advisable arrangement to use.

Q. 8. Will you measure the drawings and model, and state whether or not the distance of the bearing points of the wheels in each truck on the rails, was or was not substantially equal to the width of the gauge of the track, both in the eight wheel steam carriages, as well as in said model and drawings? If not, state what is the difference?

Question objected to, on the ground that any enquiry connected with said drawings, is inadmissible, because the same is not in evidence, and

2d. The counsel has exhausted upon the direct examination, his right to make any enquiries in relation to said model.

A. 8. They were substantially the same in all.

HORATIO ALLEN.

*Cross-examination resumed.*

Re. Cross Q. 1. Please to state, as concisely as will be consistent with your illustration, what power and comprehensiveness you intend shall be implied or understood by the word "substantially," as used in answer to question 8?

Re. Cross A. 2. I meant to say that the distance apart of the axles of the trucks, and the track or gauge of the road, were within an inch or two of being the same.

HORATIO ALLEN.

UNITED STATES OF AMERICA.

SOUTHERN DISTRICT OF NEW YORK, SS.

I, Richard E. Stilwell, a Commissioner duly appointed by the Circuit Court of the United States, for the Southern District of New York, in the Second Circuit, under and by virtue of the Acts of Congress, entitled "An Act for the more convenient taking of affidavits and bail in civil causes, depending in the Courts of the United States," passed February 20th, 1812, and the Act of Congress, entitled "An Act, in addition to an Act, entitled "An Act for the more convenient taking of affidavits and bail in civil causes, depending in the Courts of the United States," passed March 1st, 1817, and the Act, entitled "An Act to establish the Judicial Courts of the United States," passed September 24th, 1789, do hereby certify, that the reason for taking the foregoing deposition is, and the fact is, that the witness resides more than one hundred miles from the place of trial of the within cause.

I further certify, that a notification of the time and place of taking the said deposition signed by me, was made out and served on the Counsel for the Plaintiff, to be present at the taking of the deposition and to put interrogatories, if he or they might think fit.

I further certify, that on the 22d, 23d, 25th and 27th day of June, A. D., 1853, I was attended by Mr. Whiting on the part of the Defendants, and by Mr. Sickles on the part of Plaintiff, and by the witness, who was of sound mind and lawful age, and the witness was by me carefully examined and cautioned, and sworn to testify the whole truth,

and the deposition was by me reduced to writing, in the presence of the witness, and by him subscribed the same in my presence. I have retained the said deposition in my possession, for the purpose of sending the same [the same?] with my own hand, to the Court for which the same were taken.

I further certify, that I am not of Counsel or Attorney for either of the parties in said deposition and caption named, or in any way interested in the event of the said cause named in the caption.

In testimony whereof, I have hereunto set my hand and seal, this 30th day of June, in the year of our Lord one thousand eight hundred and fifty-three, and of the Independence of the United States the seventy-seventh.

RICHARD E. STILWELL,  
*U. S. Commissioner Circuit Court of the U. S.  
for the Southern District of New York.*

### UNITED STATES OF AMERICA.

SOUTHERN DISTRICT OF NEW YORK, ss.

I, John W. Nelson, Clerk of the Circuit Court of the United States of America, for the Southern District of New York, Second Circuit, do hereby certify that I am well acquainted with the handwriting of Richard E. Stilwell, whose name is subscribed to the annexed certificate, and that the signature to the same is in his proper handwriting. And I do further certify that he was at the time of signing the same, a United States Commissioner, duly appointed under and by virtue of the Acts of Congress, in such behalf made and provided, by the Circuit Court of the United States of America, for the Southern District of New York.

In testimony whereof, I have hereunto subscribed my name, and affixed the seal of the said Circuit Court, this thirtieth day of June, in the year of our Lord one thousand eight hundred and fifty-three, and of the Independence of these United States the seventy-seventh.

JOHN W. NELSON, *Clerk.*

CHARLESTON, May 16, 1831.

*To the President and Directors of the South Carolina Canal and Railroad Company.*

*Gentlemen:* In a communication laid before the Board, in November, 1829, after exhibiting the existing state of steam transportation, as applied to railroads, I ventured to express an opinion that it was at that period imperfect, and endeavored to point out the causes which had induced that opinion, and to suggest the results which might soon be anticipated from the remedy or removal of them. They were stated to exist principally in the defective arrangement of their boilers, which were, in my view, alike deficient in the means of generating heat, and of communicating it to the water when attained.

The wonderful performances on the Liverpool and Manchester Railroad, which were effected almost immediately subsequently, fully and most satisfactorily confirmed the views there expressed.

The speed which has been since attained, and the enormous loads which have been moved through the agency of steam, have alike been the result of the changes in the interior arrangement of the steam generating apparatus, by which, with comparatively light engines, a great increase of effective fire surface has been obtained.

This important end has been effected in two ways. 1st. By the actual increase of fire surface, by diminishing the diameter of the tubes, and increasing their number. The principle of the previous arrangements, that of a cylinder, secured with tubes, through which the flame and smoke proceed, was not altered, but instead of one large flue a great number of small ones were used. It is through this improvement that the engines of Messrs. Stephenson have produced their astonishing effects.

2. By increasing the velocity of the current of hot air, as well as the intensity of heat. It is in the application of this principle that Messrs. Braithwaite & Ericson have constructed their engines. The destructibility of materials under such intense heat is the great difficulty which attends the adoption of this principle in practice; and it is considered peculiarly great from their arrangement of the flue, which being *continuous*, has necessarily short bends, at which place a concentration of the heat must take place, with highly injurious effect upon the metal. The complete mastery of this useful agent has been attained in each of these plans, by introducing an artificial blast. Previously reliance had been had on a natural draft; the limit of the consumption of fuel in a given time and space was therefore soon reached. The introduction of the artificial blast greatly extended this limit, and rendered the generation of the heat a part of the mechanical operation, and thereby susceptible of regulation by the manager.

By means of these improvements in the generation and application of steam power to locomotive purposes, the means of steam transportation have made great and unexampled strides; but I believe they have only led to the path in following which much greater results may confidently be expected.

In the engine constructed for the company, by the West Point Association, the principle of the boiler used by Mr. Stephenson has been adopted, but not to so great an extent, in consequence of the difference in the fuel employed; the tubes were made as small as it was thought would be consistent with a good natural draft for so dense a smoke as that of light wood. Sufficient experience has not been had to determine how closely we have approximated to the least sized tube which would suit the fuel; the observations thus far made have exhibited no reason to desire any alteration.

While alluding, in this brief manner, to the subject of boilers, I would add that there are some reasons to believe that still greater improvements will be effected on the interesting subject, in which consists the great superiority of railroads over every other preceding species of communication.

The above arrangements, if examined theoretically, present several marks of imperfection, one or two of which I will briefly notice.

There are four distinct operations to be performed in the acquisition and use of steam power, each of which has its distinct plan and parts; and in the combination and arrangement of them consists the perfec-



tion or imperfection of the machine. There are, 1st, the consumption of the fuel; 2d, the communication of the heat through the fire surface; 3d, the water receiving the heat and thus converted into steam; and 4th, the steam chamber, which is the reservoir of the power.

It is an objection to the boilers now in use that these parts are so connected, that no material change can be introduced without affecting all the others. Thus we cannot increase the fire surface without diminishing the water and area for draught; or the capacity of the steam chamber, without essentially varying the other proportions. This will make the progress of improvement slower than it would be under other circumstances; for when a change has been made in any one part, the attention can not be confined to it alone, but must also embrace all co-operating changes.

I would not have alluded to these circumstances did I not believe that it is susceptible of remedy, and also know that experiments on a large scale are now making, which, to my view, promise much towards extensive improvement on this subject.

The boiler which I think promises the advantages is that of Dr. Nott, some of which are at this time about going into operation, both for locomotive and stationary purposes, on this as well as the other side of the Atlantic.

It consists of two semi-cylinders, having their plane surfaces opposite and parallel to each other, and connected by tubes.

The water is contained in the tubes, the lower half-cylinder, and about two or three inches in the upper.

The heat is applied to the exterior of the tubes. The water is supplied at the bottom of the lower cylinder, and the steam generated in contact with the tubes ascends without bend to the steam chamber. The fire surface can be increased or diminished without affecting the quantity of water or steam capacity; in like manner the steam capacity may be enlarged or reduced without deranging the other proportions.

In theory, therefore, this arrangement appears to possess peculiar advantages, particularly in reference to locomotive purposes, as, in consequence of the *independence* of the various parts, each may be reduced to the minimum weight to produce a given effect.

Letters from England speak in high terms of the above arrangement, and a few months will probably put [?] in possession of the effect in practice.

If we examine the four particulars above described, with regard to locomotive purposes, we will find, 1st, as to the generation of heat, that an artificial blast is necessary, in order that a given quantity of fuel may be consumed in the least time and space; 2d, as to fire surface, that it be so extended and exposed as to take up all the heat that can be generated; 3d, as to quantity of water, that it must be the least that will insure safety and uniformity of action; 4th, with regard to steam capacity, that it be suited to the character of the work. On this point, there is one consideration which, it appears to me, has never been practically attended to in the application of steam to railroads.

Previous to such application, steam had been employed principally where the work was of a nearly uniform character, or where the fly wheel was sufficient to equalize the irregularities. But in the use of

steam on an extended line of road, having various degrees of ascents and descents, and consequently requiring, with the same level, either a varying power or a corresponding increase or diminution of velocity, there are new sources of irregularity which should be provided for. The fly wheel is too heavy, and the only resource left is that of throwing up the steam generated on the more favorable portions of the line.

This can easily be done by an increased capacity of the steam chamber. In almost all the engines heretofore constructed for locomotive purposes, no more capacity has been allowed in them than in stationary engines; in most instances not so much, in consequence of the contracted arrangements for locomotive boilers.

It is, to my view, a favorable feature in Dr. Nott's boiler that this portion of it may be varied at pleasure without changing the other parts.

When we come to consider the application of locomotives to *wooden roads*, there are circumstances which call for attention, and a particular adaptation of arrangement to them. As the same amount of attendance and repairs attend engines of the various powers within the range that can be employed on railroads, it becomes a highly important object to place as great a quantity of power within one machine as possible. And this is more peculiarly the case on a road where the great and most difficult sources of expense are the attendance and repairs, while the fuel is comparatively of little consequence. As on every road there exists a *limit of weight* to be placed on each pair of wheels, and as on wooden roads this limit is much less than on an iron one, it becomes a still more interesting enquiry to ascertain by what means we may increase the quantity of power without exceeding the limit. On the Liverpool and Manchester road they appear practically to be limited to three tons on each pair of wheels, though some accounts state this to be too high, with their velocity, for the permanent benefit of the road. On a wooden road, where only one half inch iron is made use of, I would put the limit at one and a half tons per pair of wheels.

If, therefore, there can be no arrangements whereby this disadvantageous relation may be provided for, it is evident, that to convey the same quantity of goods or transport the same number of passengers, we must incur twice the expense of attendance, twice the amount of repair, and twice the liability to accident. In fact, more than twice, since in doubling the weight of the engine we are able to appropriate a greater proportion of the increased weight to steam generating purposes.

The arrangement [?] which I would propose to effect so desirable an object would be, as the limit exists in the quantity on each point of support, to increase the number of supports, *and thus distribute the weight over a greater surface*. I would therefore place the engine on six or eight weels, and limit the weight to one and a half tons to each pair.

There arise two objections to this arrangement, from the inequalities in the line of support; the one vertical, the other horizontal.

If three or four wheels were united on a side to the same rigid straight line, and the road had irregularities in its surface, there would arise great and injurious strains to the structure, from the wheels not being able to adapt themselves to the irregularities.

This difficulty may be completely obviated by giving the weight to

be supported but two points of support on each side, and making these points the centres of motion of the pairs of wheels.

This arrangement will evidently adapt itself with as much ease and simplicity to all vertical irregularities, as is the case with two wagons connected together.

As to the change of direction horizontally, as in the entrance of turn outs and the passage of curves, a very simple adjustment will relieve the arrangement from all difficulty. If we connect the frame with the cross piece only at the centre, and by a horizontal point, the two sets of wheels will thereby be enabled to pass all curvatures with the facility of two simple wagons connected in the ordinary manner.

No attempt has yet been made to accommodate the locomotive carriage to the passage of curvatures, by providing the means of changing the parallelism of the axles, and giving them the relative inclination that the radius of curvature requires.

I consider it as a point well worthy of examination, and not presenting serious difficulties. I fully believe that on the Baltimore and Ohio road, experience will *compel* them to have recourse to it. It is one of the points on which essential improvement may be expected. If successfully introduced it will much reduce, if not remove, the strain acting laterally on the wheels, in passing round curves. The leverage with which this strain acts is much increased, as the diameter of the wheel is increased; and so important is [?] to have large wheels for locomotive purposes, that some arrangement providing especially for this strain, must be made. The simplest mode which suggests itself is to extend the axle, and introduce braces between its extremity and the under side of the *felloe*. By this arrangement any required degree of strength may be attained.

I am fully impressed with the belief that locomotive wheels will, ere long, be introduced, of much greater diameter than any heretofore used. In England they have increased gradually, from  $2\frac{1}{2}$  to  $5\frac{1}{2}$  feet, and they have not as yet reached their limit.

If it be asked why, with the views herein expressed, I do not recommend the immediate introduction of some of the arrangements, I would reply, that no improvements, however much they may promise, can be effected without considerable expense and frequent disappointment, all of which may, with a little patience, be increased and borne by others. The age, especially as regards this subject, makes its improvement *by the month*, and few cannot possibly pass by without contributing some important facts connected with it. And so fortunate do I consider the situation of the present undertaking, that I fully believe, while it prudently gathers the experience of others, it will, nevertheless, take the lead in transportation by the hundred miles with the speed and economy of railroads.

The first one hundred miles in railroads ever travelled in continuation by steam, will take place in South Carolina, the proud day of which performance is not far distant.

Most respectfully,

HORATIO ALLEN, *Chief Engineer.*

HORATIO ALLEN, *June 26, 1853.*

R. E. STILWELL, *U. S. Com.*

UNITED STATES OF AMERICA.

*The Circuit Court of the United States, within and for the Massachusetts District.*

MASSACHUSETTS DISTRICT, ss.

*To L. E. Wales, Esq., U. S. Commissioner, of Wilmington, in the District of Delaware:*

Know Ye, That reposing confidence in your wisdom, prudence, and fidelity, we have appointed, and by these presents do authorize and empower you to take the answers to the interrogatories hereunto annexed, of Jonas P. Fairlamb, of Wilmington, in the State of Delaware, witness to be examined on behalf of the Defendant, and to be used in a certain cause now pending in said Court, wherein Ross Winans is Plaintiff, vs. The Eastern Railroad Company, Defendant. And to this end, at certain days to be by you appointed for that purpose, to cause said witnesses, as aforesaid, to be brought before you, and each witness, while present before you, to examine carefully on oath touching the premises. And when you shall have taken the examination as aforesaid, to reduce or cause the same to be reduced to writing, and to be subscribed by each of said witnesses in your presence. And the same, so taken and subscribed, to return, together with this Commission and your doings herein enclosed, sealed, and directed to the Circuit Court aforesaid, holden at Boston, as soon as the same shall have been executed.

In testimony whereof, we have caused the seal of the said Circuit Court to be hereunto affixed.

Witness, the Honorable Roger B. Taney, at Boston, this [?] day of [?] in the year of our Lord one thousand eight hundred and [?].

H. W. FULLER, *Clerk.*

N. B. You shall not, except by consent of the parties in writing, permit either party to attend at the taking of the deposition, either himself, or by any attorney or agent, nor to communicate by interrogatories or suggestions with the deponent, whilst giving his deposition, in answer to the interrogatories annexed to this commission. And you shall take such deposition in a place separate and apart from all other persons, and permit no person to be present during such examination, except the deponent and yourself, and such disinterested person (if any) as you may think fit to appoint as a clerk, to assist you in reducing the deposition to writing. And you shall put the several interrogatories and cross-interrogatories to the deponent in their order, and take the answer of the deponent to each, fully and clearly.

The execution of this commission appears in a certain schedule hereunto annexed.

LEONARD E. WALES,  
*U. S. Commissioner for Delaware District.*



CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. EASTERN RAILROAD COMPANY.

*Interrogatories proposed on the part of the Defendant, to Jonas P. Fairlamb, of Wilmington, in the State of Delaware.*

1. What is your name, age, place of residence, and business, or occupation?

2. Whether or not are you the inventor of any improvements in railroad cars; and if yea, whether or not you have taken out Letters Patent of the United States therefor?

3. Whether or not is the annexed copy of Letters Patent to Jonas P. Fairlamb, the same referred to in your answer?

4. Whether or not have you examined said Letters Patent, and the drawings thereto annexed; and, if so, whether or not were you the first and original inventor of the things therein claimed as your invention, according to the best of your knowledge and belief?

5. Whether or not was the invention described in your said Patent, and shown in your drawing annexed thereto, made by you before the date of said Letters Patent; if so, how long before, and when was it made by you?

6. Whether or not do you find in your said Letters Patent any description of the car shown in the drawings as an eight-wheel car; if not, will you state any reason therefor?

7. Whether or not was the drawing, a copy whereof is hereto annexed, restored at the Patent Office; and, if so, whether or not was the restored drawing a correct copy of the drawing filed in the office with the original application and specification?

8. Whether or not did you, at the time when you made your invention or improvement in railroad cars, consider the connecting of the four wheel trucks, in the way shown in your drawings, as a new invention?

9. Do you know any other matter or thing that may be of benefit to the Defendant?

WILLIAM WHITING, *Solicitor of Respondent.*

Fairlamb's Patent, or an authenticated copy thereof, is to be annexed to the commission. W. W.

UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS vs. EASTERN RAILROAD.

IN EQUITY.

*Cross-Interrogatories to Jonas P. Fairlamb, by the Complainant.*

1. Does the drawing now issued by the Patent Office, as part of the Letters Patent granted to you, in January 19th, 1833, precisely correspond with that filed by you with your original application for said Letters Patent; and is it precisely similar to the drawing issued to the Patent Office, prior to the destruction by fire? if not, state accurately and in full every particular in which they differ.

2. Will you swear that you filed any drawing with your original application; and, if yea, who made the drawing?

3. When and where did you first see an eight-wheel railroad car, of the kind in general use on American railroads, having four trucks, placed near each end of a long body, and connected therewith by a centre-bolt, the axles near together, and the whole arranged so as to be drawn by an attachment to the body of the car?

4. Please annex to your deposition an accurate copy of the drawing filed by you, on your application for Letters Patent, if you filed any such; and if any you cannot, state why?

5. Was any drawing attached to your original Letters Patent; if yea, did either that drawing, or the one filed with your original application, have any representations of an eight-wheel car, marked as figure two, on the drawing now annexed to your Patent?

6. Please state whether the original drawing had any other representations upon it, except figure one and figure three.

7. Please examine figure three, and the references thereto, and state if the two trucks are drawn precisely similar, and if not, why not?

8. Why did you not represent the axles of both trucks with your improvement upon them?

9. Where was the point of draft in the car represented by figure one?

10. Have you seen, heard, or had stated to you, the substance of any of the foregoing interrogatories; and, if yea, by whom?

C. P. CURTIS, JR., *Complainant's Solicitor.*

DEPOSITION OF JONAS P. FAIRLAMB,

*A witness produced, sworn, and examined by me, the fifth day of November, A. D. eighteen hundred and fifty-three, at my office at Wilmington, in the State of Delaware, by virtue of the annexed rule of the Circuit Court of the United States, within and for the Massachusetts District, for the examination of the said Jonas P. Fairlamb, in a certain cause there depending, wherein Ross Winans is Plaintiff, and the Eastern Railroad Company is Defendant, on the part and behalf of the Defendant.*

Jonas P. Fairlamb, being produced, sworn and examined, on the part of the Defendant, deposeth as follows:

I. To the first interrogatory this deponent says: My name is Jonas Preston Fairlamb, aged sixty-four, reside in Wilmington, and my business has generally been that of a surveyor and conveyancer.

II. To the second interrogatory this deponent says: I answer yes, to both parts of that question.

III. To the third interrogatory this deponent says: Yes, it is the same.

IV. To the fourth interrogatory this deponent says: I have examined the said Letters Patent, and the annexed drawings, and to the best of my knowledge I believe myself to have been the first and original inventor of the things therein claimed.

V. To the fifth interrogatory this deponent says: It was made before the date of the Letters Patent, some time in the year eighteen hundred and thirty-two; it is impossible for me to tell the precise time.

VI. To the sixth interrogatory this deponent says: No; and the reason is, because I made no claim to an eight-wheel car.

VII. To the seventh interrogatory this deponent says: Yes, it was; and the copy so restored was, in principle, the same as that attached to the original application.

VIII. To the eighth interrogatory this deponent says: I did not.

IX. To the ninth interrogatory this deponent says: I might say further, in reference to the eighth interrogatory, and my answer thereto, that without a connection of the cars, I could not have exemplified or delineated, by any drawing, my claim set forth in my Patent for cars running a crooked road; even the connection of a single car with the locomotive would be connecting two cars together; and, as I did not think it necessary to show a locomotive engine on my drawings, with which I had nothing to do, I therefore, as a mere matter of course, connected two of my cars, as shown by the drawings, not as my invention, but as any mechanic of the commonest capacity, after viewing my cars, would certainly do.

J. P. FAIRLAMB.

Deposition of Jonas P. Fairlamb, taken, sworn to, and subscribed by him, this fifth day of November, A. D. 1853, before me,

LEONARD E. WALES,

*U. S. Commissioner for District of Delaware.*

I. To the first cross-interrogatory, on the part of the Complainant, this deponent says: I cannot say that the drawing now issued precisely corresponds with the one filed with my original application; but it is the same in every essential principle and particular; nor can I [can I?] say that it is precisely similar to the drawing issued to the Patent Office, prior to the fire; but it is like in every essential principle and particular; I am unable [?] say in what they differ, if there is a difference.

II. To the second cross-interrogatory this deponent says: Yes, I made the drawing myself.

III. To the third cross-interrogatory this deponent says: I never saw an eight-wheel car with four trucks; I first saw one with two trucks, each truck having four wheels, about the year eighteen hundred and thirty-six, in Philadelphia, arranged as described in the question.

IV. To the fourth cross-interrogatory this deponent says: I cannot

give an exact copy of the drawing filed with my application, because the original is not in my possession.

V. To the fifth cross-interrogatory this deponent says: I can't say that any drawing was attached to my original Letters Patent.

VI. To the sixth cross-interrogatory this deponent says: It must have had other representations than figures one and three, to exemplify the claim.

VII. To the seventh cross-interrogatory this deponent says: The two trucks are not precisely similar, because the axles in figure one vibrate at the centre, and in figure two the truck vibrates at the centre of its frame.

VIII. To the eighth cross-interrogatory this deponent says: I did.

IX. To the ninth cross-interrogatory this deponent says: There is none represented, but the best place would be at the centre of the frame.

X. To the tenth cross-interrogatory this deponent says: No.

J. P. FAIRLAMB.

Deposition of Jonas P. Fairlamb, to cross-interrogatories on the part of the Complainant, taken, sworn to, and subscribed by him, before me, this fifth day of November, A. D. 1853.

LEONARD E. WALES,

*U. S. Commissioner for District of Delaware.*

## IN THE CIRCUIT COURT OF THE UNITED STATES

FOR THE DISTRICT OF MASSACHUSETTS.

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

*Depositions on behalf of the Defendants, taken before Levin Gale, United States Commissioner, at Baltimore, in the District of Maryland.*

## THE UNITED STATES OF AMERICA.

DISTRICT OF MARYLAND, TO WIT.

Be it remembered, that I, Levin Gale, a Commissioner appointed by the Circuit Court of the United States for the Fourth Circuit, in and for the District of Maryland, pursuant to the act of Congress, entitled, "An act for the more convenient taking of affidavits and bail in civil causes, depending in the courts of the United States," do hereby certify, that, pursuant to the notice hereto annexed, I proceeded, on the eighteenth day of April, in the year of our Lord one thousand eight hundred and fifty-three, at my office, in the city of Baltimore, within the District of Maryland, to take the depositions of witnesses, produced on behalf of the Defendants, in a certain civil cause, depending in the Circuit Court of the United States, for the District of Massachusetts, wherein Ross Winans is Plaintiff, and the Eastern Railroad Company is Defendant. And on the said eighteenth day of April, in the year eighteen hundred and fifty-three, appeared before me, William W. Hubbell, Esq., attorney



for the Defendant, Charles D. Gould, attorney for the Plaintiff, and Jacob Rupp, a witness, produced on behalf of the Defendant.

And the said Jacob Rupp, (being of sound mind) and being by me first carefully examined and cautioned, and duly sworn according to law, to testify the whole truth, and being examined on behalf of the Defendants, makes oath, deposeth, answereth and saith, as follows, to wit:

#### DEPOSITION OF JACOB RUPP.

*Question No. 1.* Please state your age, residence, and occupation?

*Answer.* I was born on the 22d May, 1799, I reside in the city of Baltimore, and have resided there since 1820. I am a house carpenter.

*Question No. 2.* Did you ever work for the Baltimore and Ohio Railroad Co.? if so, state during what years, and what kind of work you did?

*Answer.* I commenced to work for the Baltimore and Ohio Railroad Company, in 1830, in the month of February. I commenced laying track and getting timbers &c. out, in February, 1830, and continued at that until April, of the same year, when I went into the shop. I went in April, into the shop, in Gatch's employ. I continued under Gatch's employ, I think, until 1833. I never was asked the question before, how long I was in Gatch's employ. I was under Gatch's employ until he quit the service of the company. After Gatch left, I was employed under Gillingham, and also under Jessup. I quit the service of the Baltimore and Ohio Railroad Company, in 1837; that was the time I finished the contract.

I was engaged in repairing, and also in building new work; the work I was engaged in was in repairing and building passenger and burthen cars.

*Question No. 3.* Will you state what position Mr. Gatch, to whom you refer, held under the company, and state also his Christian name?

*Answer.* Mr. Gatch, in three days, gave all the instructions, and we worked under his instructions; his Christian name is Conduce.

*Question No. 4.* Where was the shop situated in which you worked under Mr. Gatch's instructions?

*Answer.* Out at the Mount Clare station, and also in Charles Street. I worked under his instructions in both places.

*Question No. 5.* Who worked in the shop with you at the Mount Clare station? name as many of the persons as you can recollect?

*Answer.* Francis Gatch, Emanuel Eichelberger, John Rupp, and Reuben Ayler, worked there at times; that is all I can recollect.

*Question No. 6.* What kind of work was done in the shop in which you and the persons you have just named, worked?

*Answer.* Building new cars and repairing.

*Question No. 7.* Which of the persons you have named as working in the shop with you, are living at the present time?

*Answer.* John Rupp and Eichelberger; that is all of those I have mentioned.

*Question No. 8.* Was there another shop near by? if so, state who worked in it, and what kind of work was done in it?

*Answer.* There was a coach-maker's shop near by; Oliver Cromwell worked in it. There was also a blacksmith's shop near by, and

Leonard Forrest worked in it. Also a paint shop was attached to the place, and John Eichelberger worked in it.

*Question No. 9.* State what kind of cars you and those who worked with you built in the Mount Clare shops, at the time you refer to?

*Answer.* They were four wheel cars; trucks, with platforms on them, and some had bodies on them.

*Question No. 10.* State the time when these four wheel cars were built?

*Answer.* They were commenced in 1830.

*Question No. 11.* Will you state in what manner long timbers, called string pieces, were hauled on the road; describe particularly the method of construction or arrangement, and state the time when they were hauled?

*Answer.* That was in the commencement of 1830, early in the month of April. There were two platform cars, put together by a coupling, and there was a hole put in, and a plate on the platform, and a bolster, with a hole through it, and the bolster was put on the plate, and a pin went through the bolster into the plate which was on the platform. At the first commencement of the bolster cars, as I call them, the timbers were placed on the bolsters, and carried out in that way.

*Question No. 12.* Who suggested and got up these timber cars?

*Answer.* Mr. Gatch, and Charles Wentz; they first spoke of them, and said they thought that would answer to carry long timbers; Charles Wentz is dead?

*Question No. 13.* Which Mr. Gatch do you mean got up the timber cars?

*Answer.* Conduce Gatch.

*Question No. 14.* When the timber car was arranged as you have described, with its load of timber on, did it form, in its principles, an eight wheel car? and state whether persons were in the habit, or did ride upon the timber upon it?

*Answer.* It did form everything that an eight wheel car is now. Persons were in the habit of riding on it. The mechanics that were at work on the road, and laborers, also, used to ride on it. They would ride on the platforms when they were unloaded, and, when loaded, would ride on the timber.

*Question No. 15.* How close were the wheels in each truck to each other, as near as you can recollect?

*Answer.* Between eight and ten inches.

*Question No. 16.* How many, as near as you can recollect, of these eight wheel timber cars, were in use on the road in 1830, hauling long timbers?

*Answer.* There was but one train, and Mr. Wentz drove it; used in hauling timber at the time the eight wheel timber car was constructed.

*Question No. 17.* For what purpose was the eight wheel car next used on the road, after hauling long timbers?

*Answer.* For bringing in cord wood from the country.

*Question No. 18.* Will you describe the construction of the eight wheel car, for hauling cord wood?

*Answer.* There was a strong bolster put on the four wheel truck, and there were two four wheel trucks to form the car, and there was a bolster put on each truck, and two pieces put on each end of the bolster,

and bolted fast, so that it would be long enough to lay the cord wood across it, and pile it on; and there were two standards put at each end to keep the wood from falling off, and that completed a car of that description.

*Question No. 19.* How were the bolsters upon the two trucks, that rested upon the trucks, fixed or secured to the trucks?

*Answer.* There was a strong pin put through the bolster, and down into the truck bolster.

*Question No. 20.* Did that pin, through each bolster, allow the trucks to swivel, to suit the curves and switches in the road?

*Answer.* It did. That was what it was intended for, to go around the curves. Those cars, at that time, pulled at a perch.

*Question No. 21.* At what time was the first one of these eight wheel wood cars first put in use on the road?

*Answer.* In 1830; some where about September or October, as well as I can recollect; it was in the fall.

*Question No. 22.* Who constructed or built this eight wheel wood car, and who gave the directions? whose invention was it?

*Answer.* It must have been Mr. Gatch's invention; he always gave the instructions for building it. I never heard who was the inventor of it. I could not say who built it; it was built in the shop, among the hands there, and it is likely I helped to build it. I helped to build some of them, but I can't say positively that I helped to build the first one. There was a good many of them put up. They had more than one and more than two a running on the road, I know.

*Question No. 23.* How many of these eight wheel wood cars, as near as you can recollect, were running on the road in the fall and winter of 1830?

*Answer.* I could not answer that question positively. I know there was more than one or two. I will say there were three.

*Question No. 24.* Were they all engaged generally in carrying cord wood?

*Answer.* Those that I saw were.

*Question No. 25.* How close together, to the best of your recollection, were the wheels in each track?

*Answer.* Between eight and ten inches.

*Question No. 26.* About what number of cords of wood was the usual load carried by each of these cars?

*Answer.* I think, as near as I can recollect, about two cords. I think that was what they were calculated to carry.

Thereupon, adjourned until to-morrow morning, April 19, 1853, at 10 o'clock, A. M.

On the 19th day of April, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esq., Attorney for the Defendant, Charles D. Gould, Esq., Attorney for the Plaintiff, and the witness, Jacob Rupp, and, thereupon, I further proceeded with the deposition, as follows, to wit: During the course of the examination, John H. B. Latrobe, Esq., Attorney for the Plaintiff, also appeared.

*Question No. 27.* State if you have examined the model E, now before you; and state what cars it represents, and where and when they were used?

*Answer.* That is the car that was used in 1830, on the Baltimore and Ohio Railroad. I have examined the model, and that is the car.

*Question No. 28.* What was the car used for at the time mentioned?

*Answer.* At the time mentioned, it was used in carrying railroad timber; and after they were done using it for carrying timber, they used it for hauling cord wood.

*Question No. 29.* State if this model represents the cord wood cars you described yesterday?

*Answer.* It does. It is the very car, as near as it can be made, in every part.

*Question No. 30.* As near as you can recollect, how many of said eight wheel cars were in use on the Baltimore and Ohio Railroad, carrying cord wood, by the opening of the spring of 1831?

*Answer.* As near as I can recollect, there must have been sixteen or seventeen cars on the road by that time, of the description mentioned in the question, for hauling cord wood.

*Question No. 31.* After these eight wheel cord wood cars had been in operation, as you have described, for what purpose was the next eight wheel car built, and by what name, if any, was it designated?

*Answer.* The next car was the Columbus, a passenger car.

*Question No. 32.* When was she commenced?

*Answer.* She was commenced in 1831.

*Question No. 33.* At what time in 1831 was the construction of her commenced?

*Answer.* As near as I can recollect, it was in March or April.

*Question No. 34.* Under whose instructions was the Columbus built, and who did the work?

*Answer.* Mr. Conduce Gatch gave me the instructions, and I worked on it.

*Question No. 35.* Upon what part of the Columbus did you work? and state if any person worked with you?

*Answer.* I built the running gears; Mr. Francis Gatch and I built the running gears together.

*Question No. 36.* Who built the body of the Columbus, and who did the iron work?

*Answer.* Mr. Oliver Cromwell built the body, and Mr. Leonard Forrest did the iron work.

*Question No. 37.* Who painted the Columbus?

*Answer.* Mr. John Eichelburger.

*Question No. 38.* At what time, as near as you can recollect, was the Columbus first put upon the railroad?

*Answer.* She was put on the railroad before the fourth day of July, 1831; the mechanics took a ride out in her on the road.

*Question No. 39.* How long before the fourth day of July, 1831?

*Answer.* A few days before it. I can't recollect the precise day.

*Question No. 40.* When the Columbus was first put upon the road, had she a rod extending between the two trucks under the body attached to the trucks?

*Answer.* There was a rod attached from one truck to the other under the space extending between the trucks.

*Question No. 41.* Was that rod removed afterwards, and in about how long a time was it removed?



*Answer.* It was removed a very short time after the car commenced running.

*Question No. 42.* When the Columbus was first put upon the road, had she a railing on top of the body?

*Answer.* She had none.

*Question No. 43.* Was a railing afterwards put upon the top of the body? if so, when was it done and who made it?

*Answer.* There was a railing afterwards put on the top of the body. Leonard Forrest made it and put it on. I and the other mechanics helped to put it on. The railing was put on directly after the fourth of July, in the same year.

*Question No. 44.* Was the rod removed from underneath the body before or after the railing was put on top?

*Answer.* It was removed before the railing was put on.

*Question No. 45.* Did you see any drawing at the shop when the Columbus was commenced? if so, state who had the drawing, what it represented, and describe the drawing by color or otherwise?

*Answer.* I did see a drawing, it was in the possession of Oliver Cromwell. I could not call it a drawing, it was a sketch, it represented a kind of square box or frame, marked off so as to show the framing. I think it was made in yellow color, that is as well as I can now recollect.

*Question No. 46.* What did you at the time understand the drawing to represent or be intended for?

*Answer.* I did not understand what it was for, except what I was told it was going to be. I was told it was intended to be a car body. I had never seen anything like it before.

*Question No. 47.* Was there any running gear or trucks on the drawing or sketch at that time? and was there any railing on top of the sketch or drawing at that time?

*Answer.* There were none.

*Question No. 48.* In making the trucks or running gear of the Columbus, did you work from a drawing? if so, on what was it made, and who drew or made the drawing?

*Answer.* Mr. Conduce Gatch made the drawing on a board, and we worked by that; we fitted up the running gear by that drawing.

*Question No. 49.* Were you in the habit of working or making the running gear or frame work of it from drawings made upon such a board, or how did Mr. Gatch give his instructions?

*Answer.* We had been in the habit of working by his drawings until we got acquainted with the work. The drawings which he made for us were usually made on a board.

*Question No. 50.* Was the car Columbus built upon the same or upon a different principle from the wood cars? if the principle differed describe the difference.

*Answer.* It was built on the same principle in the coupling together, and it was also drawn by a perch.

*Question No. 51.* Do you know whether the Columbus was used or run on the road on the fourth of July, 1831? state your knowledge on the subject.

*Answer.* She was, to my knowledge and recollection.

*Question No. 52.* How long a time, to the best of your recollection, was the Columbus used upon the road?

*Answer.* Something like three or four years, according to my recollection.

*Question No. 53.* Who gave Leonard Forrest instructions, if any one, to make the centre pins and other iron work of the Columbus?

*Answer.* Mr. Conduce Gatch gave all the instructions at those times.

*Question No. 54.* Did you ever see or hear Ross Winans give instructions to any one in the construction of the Columbus?

*Answer.* I did not.

*Question No. 55.* Who had charge of the alterations or construction of the trucks of the cars while you were in the company's employ?

*Answer.* At those times Conduce Gatch.

*Question No. 56.* Who did the work?

*Answer.* I and Francis Gatch.

*Question No. 57.* Had the trucks of the Columbus, when she was first put on the road, friction wheels applied to them at that time, called Winan's friction wheels, for the journals of the axles to run on?

*Answer.* I cannot recollect. I know we made alterations on her, we put plain boxes on her, but I cannot state whether Winan's were on the car or not.

*Question No. 58.* State what alterations you made in the running gear of the Columbus, or in the trucks spoken of?

*Answer.* I cannot recollect; there were alterations made, but I cannot state what the alterations were.

*Question No. 59.* Did you put a stouter bolster on?

*Answer.* Yes, I did put a stouter bolster on; the first were too weak; they sprung.

*Question No. 60.* About what distance apart, in the Columbus, were the wheels in each truck, as near as you can recollect?

*Answer.* Between seven and eight inches.

*Question No. 61.* What was about the diameter of the wheels across the face, used on the Baltimore and Ohio Railroad at that time?

*Answer.* I could not say that there was any difference between those used then and those used now. They were somewhere about thirty-one inches in diameter.

*Question No. 62.* When you altered the trucks of the Columbus, or at any time, did you alter the distance of the wheels apart, in each of her trucks?

*Answer.* Not to my recollection.

*Question No. 63.* Did you know or were you personally acquainted with Ross Winans at the time you were building the trucks for the Columbus?

*Answer.* I was not acquainted with him; I did not know him.

*Question No. 64.* Do you recollect, if so, state what eight-wheel car for carrying passengers was built next after the Columbus? and when, as near as you can recollect, was she built?

*Answer.* That was the "Winchester," built in 1832, as near as I can recollect, in the fall of the year.

*Question No. 65.* What kind of trucks had the Winchester under her? state as near as you remember?

*Answer.* She had the same kind of trucks, as near as I can recollect, with plain boxes on, and a perch to the running gear.

*Question No. 66.* How many bodies had the Winchester, and how were they fixed or supported?

*Answer.* She had three bodies, and they were supported on pieces like the bearing pieces on model E.

*Question No. 67.* What was the name of the next car built for passengers, after the Winchester? and when, as near as you can recollect, was she built?

*Answer.* The Dromedary was the next, according to my recollection; she was built in 1834, in the summer season.

*Question No. 68.* At which shop were the Winchester and Dromedary built?

*Answer.* At the shop at the corner of Camden and Charles streets.

*Question No. 70.* State how all these cars were drawn; if in the same way, or different, and who put the drawing fixtures to them.

*Answer.* They were all drawn by the perch, in the same way as the wood car. Francis Gatch and I put the fixtures for drawing to them when we built the running gear.

*Question No. 71.* Was either of these cars, the Columbus, Winchester or Dromedary, at any time drawn by a coupling from the middle of the end of the body, before the first of October, 1834.

*Answer.* No, they were all drawn by the perch.

*Question No. 72.* Were the Winchester and Dromedary the same or different in their principle, from the wood cars used in 1830?

*Answer.* They were the same in principle.

*Question No. 73.* Were the Winchester and Dromedary also used on the road for carrying passengers, and for how long a time, within your recollection?

*Answer.* They were used two or three years, to the best of my recollection, for carrying passengers.

*Question No. 74.* What capacity or position did George Gillingham fill in the service of the Company?

*Answer.* He was boss superintendent of the shops.

*Question No. 75.* When were cars built for carrying freight under cover upon eight wheels, after the Winchester or Dromedary, and who built them, and state whether under contract, and if so, with whom and how many were to be built?

*Answer.* I undertook a contract in 1834, and commenced them in 1835. I contracted with George Gillingham, and built one hundred and ten cars of that description.

*Question No. 76.* State whether these covered freight cars were the same or different in principle from the eight-wheel wood cars of 1830; and if different, state what the difference was.

*Answer.* There was no difference in principle, the way they were coupled together to carry. All the difference in principle, is that they have springs now, and they had none then; and they draw now in the centre of the body, whereas before they were drawn by the perch. All the difference I see, is that they have got springs now, and they had none then.

*Question No. 77.* State whether the covered freight cars built by you in 1835, as you have said, were the same or different in principle from

the eight-wheel wood cars of 1830; and if different, state what the difference was at that time, 1835?

*Answer.* There was a difference made in the running gears, and they were coupled as close as we could get them for going around curves, which was supposed to be an advantage; that was the difference. That is, the wheels were got as close together as we could.

*Question No. 78.* Was there any difference in the mode of drawing those freight cars, from the mode of drawing the wood cars of 1830?

*Answer.* There was; they were drawn from the centre of the body.

*Question No. 79.* On what kind of cars, whether four-wheel or eight-wheel cars, were springs first used on the road, and in what year?

*Answer.* As near as I can recollect, they were used in 1834; they were first used on the four-wheel cars, that were called freight cars in those days.

*Question No. 80.* Will you state who invented and constructed the mode of drawing the eight-wheel car on the Baltimore and Ohio Railroad, by a coupling from the middle of the end or centre of the body?

*Answer.* It was my instructions. It was I who invented that mode of drawing.

*Question No. 81.* Will you state to whom you first suggested this mode of drawing the car; state who was present, where it was, what you were doing, and all the circumstances connected with it, as near as you now recollect?

*Answer.* I had put the frame together, and had it laying on the floor in the shop, and I spoke to Mr. Gillingham about drawing it, how he intended to draw the car after it was put together, as the frame laid on the floor, and I asked him for the irons that go on to the frame, and asked him how he intended to draw it; he said he would draw it by chains on each side of the frame, to couple the cars together; recollect I told him those cars could never stand in the way he intended to draw them; he asked me why they could not; I told him the cars could never be kept square, pulled all on one side, going around curves; Mr. Ross Winans was standing by at the time, so Mr. Gillingham asked me how I would fix them; I told him I had a plan, so I laid it before him, how to draw them; put two pieces across the front, and bolted them down tight to the end or side pieces, and I then showed him how to fix the coupling, to draw them by, and told him they could not be drawn in any other way; the car would not stand; so at the time I was waiting for my irons—waiting for him—he told me he would call around again at dinner time, and let me know what I was to do; so he came back near dinner time, and told me to make the patterns for my irons, and have them ordered, and I could go on with the work, that my plan would answer; that is all about what was said at this time, but he took my plan, and cars are drawn by it to this day.

*Question No. 82.* You say that Mr. Ross Winans was standing by at the time that you showed Mr. Gillingham your plan for drawing the cars; did Mr. Winans say anything at the time, or do anything? state the facts.

*Answer.* He said nothing to me, and did nothing; Mr. Winans and Gillingham went out of the shop together, as soon as I was done talking to Gillingham.



*Question No. 83.* Did you proceed and make all of the cars under your contract with the mode of drawing suggested by you to Mr. Gillingham, in Ross Winans' presence?

*Answer.* I did; I completed the contract upon the same principle.

*Question No. 84.* Do you remember eight-wheel cars built for the Washington branch road, called the Washington passenger cars?

*Answer.* There were cars built at the time I were building mine.

*Question No. 85.* Had you any of your covered freight cars on the road before the Washington cars were finished?

*Answer.* Indeed I can't answer that question; I can't say whether the passenger cars, or my cars, were first put on the road, but some of my cars were put on the Washington road.

*Question No. 86.* Who built the trucks of the Washington cars?

*Answer.* I built some of them.

*Question No. 87.* In what year were the Washington cars built?

*Answer.* I built trucks at the same time I was building the freight cars, in 1835; so they must have been finished in 1835; I built the trucks in that year.

*Question No. 88.* At what time, as near as you can recollect, did you suggest or show to George Gillingham, in Ross Winans' presence, the mode of drawing by the middle of the ends of the body?

*Answer.* It was in March or April, 1835; I know it was cool then.

*Question No. 89.* Did Ross Winans ever give you any instructions concerning the cars you were building?

*Answer.* No; Mr. Gillingham gave me all my instructions at that time.

*Question No. 90.* What kind of trucks were put under the Washington passenger cars? had they wheel frames, or were they constructed with long springs, to connect the axles together?

*Answer.* They had wheel-frames, and some short springs.

*Question No. 91.* Who did you believe in 1830, and in 1831, was the inventor of the eight-wheel cars in use on the Baltimore and Ohio Railroad, for carrying cord wood and passengers?

*Answer.* Conduce Gatch was the man; he gave all the instructions to us.

JACOB RUPP.

LEVIN GALE, *Commissioner.*

And the said Jacob Rupp, being cross-examined by Charles D. Gould, Esq., Attorney of the Plaintiff, further says:

*X Question No. 92.* What is your age?

*Answer.* I was born in 1799, on the 22d May; I can't calculate it just now; you can calculate it in your own way; I can't figure it out myself.

*X Question No. 93.* What persons worked with you, under Conduce Gatch, in 1830 and the spring of 1831?

*Answer.* Francis A. Gatch, Emanuel Eichelberger, John Rupp; there were more that worked there, but I cannot think of them now; there was, in the adjoining shop, Mr. Cromwell and John Eichelberger, the painter in the paint shop, and Leonard Forrest in the blacksmith shop.

*X Question No. 94.* Did not Michael M. Glenn, Washington O. Frost, P. Fullerton, also work with you in the shops spoken of?

*Answer.* Washington O. Frost worked on the road, when it was good

weather; he was in and out of the shops. Glenn was pretty much in the same way; he was sometimes in the shop and sometimes out of it. I did not consider them in the shop. Fullerton was a laborer; he worked outside, and attended to carrying stuff for the carpenters and such like jobs.

*X Question No. 95.* Did C. Parraway work with you in the said shops? and at what business?

*Answer.* I can't recollect that gentleman.

*X Question No. 96.* Was Mr. Gatch ever called to go out on the road, to attend to any duty, to your knowledge?

*Answer.* There was some cars broke down, that he went out to attend to.

*X Question No. 97.* Were there any other occasions upon which he went out?

*Answer.* There were; he was called out often on the road.

*X Question No. 98.* For what duty?

*Answer.* When cars would be broken, he had to attend to them, and see them brought in.

*X Question No. 99.* Did you ever see Ross Winans or John Elgar give him any instructions about the construction of cars?

*Answer.* I have seen John Elgar often in the shop; but, about giving any instructions, I could not say; he was always working at the turn outs.

*X Question No. 100.* What position did Ross Winans hold in the service of the Company, and what were his duties?

*Answer.* I could not answer that question; I do not know; I never could learn what his duties were; I had no conversation with Mr. Winans; I was merely hired to do what Mr. Gatch directed, in those days.

*X Question No. 101.* Was there more than one kind of four-wheel freight cars used on said Baltimore and Ohio Railroad Company, in 1830?

*Answer.* There were cars with boxes on them, in which lime used to be carried, and there were platform cars; those were the only two kinds of freight four-wheel cars then in use.

*X Question No. 102.* Describe the four-wheel freight car of which you have spoken, in use on said road, in 1830; state the size of the wheels used in said cars, the distance the axles were placed apart, the length of the platform on which the load was placed, and the width of the body of the car?

*Answer.* The size of the wheel was somewhere about thirty or thirty-one inches in diameter, as well as I can recollect; I cannot answer the question as to the distance between the axles; I don't know that I ever took any measure of them; the faces of the wheels were about eight or ten inches apart; the platform was generally ten feet long—from seven and a half feet to ten feet long—and the width of the body of the platform was from seven and a half to eight feet.

*X Question No. 103.* Were the wheels of four-wheel cars placed at any other distance apart, in 1830 and 1831? and, if yea, when, to your knowledge?

*Answer.* There have been different cars built, in which there was a difference in the space between the wheels, about that time; there was not, at that time, any regular space set for the distance between the

wheels; this was in the beginning of the building of cars; this was in 1830 and 1831.

*X Question No. 104.* Can you state in what month, of which year, any of these changes in the proportions of cars were made?

*Answer.* No, I could never recollect the month.

*X Question No. 105.* Can you state positively in which year? and, if yea, by what are you guided in your recollection?

*Answer.* In 1830 there was a car built for the Ellicotts, and the wheels were put very far apart; further than any we had on the road at that time.

*X Question No. 106.* Can you recollect any other instance? if yea, what was it?

*Answer.* I can't recollect any other.

*X Question No. 107.* When were the wheels first brought nearer together, than in the ordinary four-wheel car of which you have spoken, for use on said road?

*Answer.* In 1835 I had orders to bring mine as close together as possible, when I was building cars under my contract.

*X Question No. 108.* Is that the first instance in which you had knowledge of the wheels being brought closer together than in the ordinary four-wheel cars, or trucks, in use on said road, of which you have spoken?

*Answer.* That is according to my recollection.

*X Question No. 109.* You have referred to a platform car, and a box car, in use on said road, both having four wheels; were they one and the same car, with or without the body?

*Answer.* There was the difference in this respect, that the box cars were without springs, and the cars made by me had springs; and the bearing was closer on mine than on those box cars.

*X Question No. 110.* Were the wheels the same distance apart in the four-wheel platform car and in the four-wheel box car, used in 1830 and 1831?

*Answer.* Those two cars were the same distance apart between the wheels, except the car built for the Ellicotts, to which I have referred.

*X Question No. 111.* Did the workmen in said shops, in 1830 and 1831, choose the distance at which the axles of four-wheel cars were placed apart, when intended for use on said road?

*Answer.* When there was any alteration, Mr. Conduce Gatch made the alteration—that is, gave the orders—that is, with regard to the car for the Ellicotts, of which I have spoken.

*X Question No. 112.* Were the four-wheel cars—trucks, as you have called them, in your direct examination—that were used to carry wood and timber, as you have stated, such four-wheel cars as were used for the ordinary business of said road, when used as four-wheel cars?

*Answer.* They were about the same; the same as the box and platform cars, only they were only a platform.

*X Question No. 113.* What have you to guide you in stating the distance between the wheels of the four-wheel cars used on said road?

*Answer.* We were guided by our frames generally, that the wheels should work in between the bolsters and end pieces, so that the wheels should not strike the cross-pieces.

*X Question No. 114.* What now enables you to state that the dis-

tance between the wheels in the cars, built and used in 1830 and 1831, in said shops, and on said road, was from eight to ten inches?

*Answer.* My recollection is based upon the fact that there was a difference in the size of the cars, and in the spaces; and I refer again to the car built for Ellicotts.

*X Question No. 115.* Do you recollect of any other instance of a change in the spaces between the wheels, in 1830 or 1831, than in the instance of the Ellicott car, as mentioned by you?

*Answer.* I do not; only the ones I made under my contract.

*X Question No. 116.* Do you refer to the cars made under your contract in 1835?

*Answer.* I do.

Thereupon, adjourned until to-morrow morning, the 20th of April, 1853, at 10 o'clock, A. M.

On this 20th day of April, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esq., the Attorney of the Defendant, Charles D. Gould, Esq., the Plaintiff's Attorney, Ross Winans, the Plaintiff himself, and the witness, Jacob Rupp; and, thereupon, I further proceeded with the deposition, as follows, to-wit:

*X Question No. 117.* From what locality, or from whom, was the wood obtained which was brought over said road in 1830, on said cars, arranged with timbers to connect them?

*Answer.* I cannot recollect, it has been so long ago: we made no inquiry into that; we never knew who it was sent by.

*X Question No. 118.* By whom or which of the drivers on said road was cord wood brought on said cars to the city of Baltimore?

*Answer.* I do not know. I did not know any of them to my recollection.

*X Question No. 119.* What kind of car was first used for bringing cord wood over said road to said city?

*Answer.* The platform car, with a frame, as is represented in model E.

*X Question No. 120.* Do you mean the cars of which you have spoken, with bolsters, and connected by timbers, the bolsters and timbers bolted together by bolts represented in model E.

*Answer.* I do.

*X Question No. 121.* Was there any other kind of car used for carrying cord wood on said road before you constructed cars under your contract in 1835?

*Answer.* There were. There was the box car in which wood was carried.

*X Question No. 122.* State the manner in which the box car was arranged, fully?

*Answer.* There were box cars in which there were pieces of cord wood put in at the time—said pieces being a part of the load—at each end, to keep the wood from falling out, and then the wood was thrown in.

*X Question No. 123.* Were there any four-wheel cars arranged with timbers not greater in length than the car itself, used on said road for bringing wood to said city?

*Answer.* I have not seen any.



*X Question No. 124.* Do you think you saw all the kinds of cars used on said road in 1830 and 1831?

*Answer.* I do think I have, because I was working at the place, and I don't see but that I did.

*X Question No. 125.* While you were at work in said shops, under Conduce Gatch, in 1830 and 1831, was there not four-wheel platform cars arranged with timbers, extending nearly or quite the length of the platforms, with standards at or near the ends of the timbers, for the purpose of bringing cord wood to said city?

*Answer.* There were some there, but I would not wish to say in what years they were there. I cannot say whether they were there in those years or not.

*X Question No. 126.* Of what size square was the timber which was used in making the bolsters for the timber and wood cars of which you have spoken, or of what size square were the bolsters used on said timber and wood cars?

*Answer.* Do you refer to the car represented in model E? The bolsters of the cars represented in the model E, to which I refer, were from six to ten inches square. Some were more, some less.

*X Question No. 127.* Of what size square were the timbers of said wood car, on which the cord wood was piled?

*Answer.* We generally used the string pieces in use on said road. They were generally from five to six inches square; some more, some less.

*X Question No. 128.* Of what kind of timber were they?

*Answer.* We generally used yellow pine; that was the kind of wood generally used.

*X Question No. 129.* What was the distance between the standards?

*Answer.* I cannot recollect that; generally they were built to carry two cords; some more, some less; but I don't recollect the distance.

*X Question No. 130.* Were the timbers, when used as described, in forming the wood car, braced in any way to carry the load of cord wood?

*Answer.* There was always braces in the running gear.

*X Question No. 131.* Were there any braces in the timbers on which the wood was piled?

*Answer.* Not to my recollection.

*X Question No. 132.* What was the distance between the standards of the wood car, as described by you?

*Answer.* I don't know whether you mean the distance between the standards crosswise or lengthwise. I have already explained the distance between them lengthwise.

*X Question No. 133.* What distance lengthwise of the timber frame of the wood car, as described, were the standards apart, in feet and inches?

*Answer.* I never made any calculation of it; I never saw a calculation made of it.

*X Question No. 134.* What quantity was regarded as a load on said wood car?

*Answer.* I never made any inquiry into that.

*X Question No. 135.* What length was the cord wood cut before it was piled on said car?

*Answer.* I never measured it nor made any inquiry into it.

*X Question No. 136.* What length is cord wood usually cut for market?

*Answer.* When I used to cut cord wood in my young days they used to cut it four feet.

*X Question No. 137.* Is that the usual length for the Baltimore market?

*Answer.* I never made any inquiry; if I had made inquiry of the wood corders I might have ascertained that; but I have made none.

*X Question No. 138.* How high above the platform or timbers of said car was the cord wood piled, or how high did it appear to be, when the car was loaded, as near as you recollect?

*Answer.* I never measured it, but I know when I stood up I could not reach the top with my hand.

*X Question No. 139.* Does the model E, to which you have referred, and which is made and exhibited in this case, accurately represent, in parts and proportions, the timber car to which you have heretofore referred?

*Answer.* I suppose it does.

*X Question No. 140.* How much cord wood would a pile seventeen feet long, four feet wide, and six feet high measure, as near as you can judge?

[Objected to by Defendants' Attorney.]

*Answer.* I can't calculate it. I am no calculator of any thing like that.

*X Question No. 141.* Would it measure two cords, or about how much more?

[Objected to by Defendants' Attorney.]

*Answer.* It would measure two cords, I suppose.

*X Question No. 142.* Were the cord wood cars, of which you have spoken, ever taken apart, and the four-wheel cars, of which they were in part made, used for the ordinary purposes of the said road, particularly in 1830?

*Answer.* Generally when they were not wanted for carrying wood, the timbers were taken off, and the cars were used, when they wanted them, for any purpose. They were not used in summer time, scarcely, for hauling wood. Some of them were standing about; but I know that in some cases the timbers were taken off, and the platforms were used, because they had other use for them.

*X Question No. 143.* How many of the wood cars, arranged as you have described, were in use on said road in the summer of 1830?

*Answer.* They had none in the summer of 1830. But they had a small number, say two or three, in the fall of 1830.

*X Question No. 144.* How many were used in the fall of 1830, before the winter?

*Answer.* I mentioned in the answer to the preceding question, and I don't recollect that there were more or less than I mentioned.

*X Question No. 146.* How many in the winter of 1830-31, before the 1st of March, 1831?

*Answer.* Towards the spring, as well as I can recollect, there were sixteen or seventeen cars on the road.

*X Question No. 146.* Were these all constructed or built in the shops to which you have referred?

*Answer.* Yes; they had no other shops at those times.

*X Question No. 147.* What circumstances enable you to fix the time, or in what way do you fix the time, in which these cars were built or used?

*Answer.* I fix the time I was employed there, and know th year, and that is the way I fix the time by.

*X Question No. 148.* Were you not employed there in said shops during the years 1830, 1831, 1832, and 1833? and if yea, can you state precisely in which year the said wood cars were first used?

*Answer.* I was employed in said shops during said years. Those cars were used in 1830, in the fall of the year.

*X Question No. 149.* Since you were employed during the several years stated, what induces you to fix upon the fall of the year 1830 as the time when the use of the wood cars spoken of by you was commenced?

*Answer.* Nothing fixes me, any further than my recollection.

*X Question No. 150.* Was the car described by you, and called the wood car, used for any other purpose during the years 1830 and 1831, than for hauling wood on said road?

*Answer.* I have answered that question before.

*X Question No. 151.* Will you state again whether it was used for any other purpose, and if yea, for what purpose?

*Answer.* They were used for different purposes; the platform for stone, and whatever they chose to haul on them. I have often seen them carry iron out on them.

*X Question No. 152.* Do you mean that the timber car with eight wheels was used for carrying iron on?

*Answer.* The platforms; they used to take out castings on the platforms, for switches and such places.

*X Question No. 153.* Do you mean the platform on the four-wheel car, or the platform on the eight-wheel car, spoken of by you, and represented in model E?

*Answer.* The timbers were taken off, and the platform with four wheels were used for carrying iron, as stated, when they were wanted.

*X Question No. 154.* For what kind of stone was the car represented in model E used to carry?

*Answer.* They could carry any kind of stone on them.

*X Question No. 155.* What kind of stone was carried on them, to your knowledge, in 1830 and 1831?

[Objected to by Defendant's Attorney.]

*Answer.* I have seen stone on the car that we used to put under the sleepers when we bedded the sleepers.

*X Question No. 156.* Was this in the year 1830, or in the year 1831?

*Answer.* There was stone carried in 1831.

*X Question No. 157.* Was there stone carried in 1830 on such cars as is represented in model E?

*Answer.* The car was used on the road at the time; but whether they carried any stone on them in 1830 or not, I can't say.

*X Question No. 158.* Do you mean to state that stone was carried

on the car represented in model E in 1831? if yea, where was the stone obtained, and where delivered, and for what was it used, and whom did you see using the car carrying said stone?

*Answer.* I do mean to state that stone was carried on the car represented by model E, in 1831. The cars were at Mount Clare when I saw the stone on them; that was when I saw the car loaded—the platform car. I don't know where it was delivered, nor do I know for what it was used. I did not know who the drivers of said cars were.

*X Question No. 159.* Do you mean to say that you saw a car, such as is represented in model E, loaded with stone at the Mount Clare station; I mean two cars, with four wheels each, having upon them and connecting them a frame of timber, on which frame of timber connecting them the stone was loaded? If yea, what size were the blocks of stone, and were they such as were used in laying the track of said road? or for what purpose was the said stone intended?

*Answer.* I did not state that the stone was loaded on the timber frame; they were on the platform.

*X Question No. 160.* Do you mean to state that while the two four-wheel cars were connected by the timbers, as represented in model E, you saw at the Mount Clare station in the year 1830 or 1831, stone loaded on the four-wheel cars, while so connected by the timber frame.

*Answer.* They were not connected; they were single; the stone was on the platform.

*X Question No. 161.* For what other purpose than carrying wood did you, during the years 1830 and 1831, see the platform loaded while connecting two four wheel cars, or the timber frame loaded while connecting said cars?

*Answer.* I did not see them at that time while connected together loaded with any thing but wood.

*X Question No. 162.* Do you mean to state that you could not reach above the top of the pile of wood loaded on the timber frame connecting the four-wheel cars, as represented in model E, while you yourself stood on the four wheel platform car; or on the timbers on which the wood was laid; or how high do you mean to state that it was above said frame on which the wood rested?

*Answer.* I state when I stood on the ground, not on the platform, I could not reach the top of the wood. I never measured how high the wood was above the frame.

*X Question No. 163.* About how high was the wood piled on said platform, or on the timbers on which it was carried on said car, as near as you can recollect?

*Answer.* It might have been between three and four feet, or the like of that.

*X Question No. 164.* Was the car regarded as loaded when it had this amount of wood on it?

*Answer.* It must have been loaded, else it would not have had the wood on it.

*X Question No. 165.* Was it regarded as fully loaded, with as much load as the car was designed to carry?

*Answer.* That I could not say.

*X Question No. 166.* Were these cars drawn by steam or by horse



power, in 1830? I mean the car represented in model E, that is, the wood car having eight wheels?

*Answer.* They were drawn by teams of horses and mules they had there.

*X Question No. 167.* Were four-wheel cars used on said road during the years 1830 and 1831 to carry wood on?

*Answer.* They were used.

*X Question No. 168.* How many were used during those years for that purpose singly, not in pairs?

*Answer.* I have no recollection of how many there were, but they were used.

*X Question No. 169.* What enables you to recollect the number of eight-wheel cars, and not the number of four-wheel cars, used for this purpose in 1830?

*Answer.* My memory is what enables, as I stated before.

*X Question No. 170.* What was the distance between the uprights at the ends of the load of wood, used on the four-wheel cars, to keep the wood from falling off?

[Objected to by Defendants' Attorney.]

*Answer.* I have not measured the space between.

*X Question No. 171.* Do you mean to say that you cannot tell the distance which these standards were apart, in the four-wheel car, when used for carrying wood, in 1830 and 1831?

*Answer.* I cannot recollect the space in between them.

*X Question No. 172.* Who made the model E, which you have referred to; and which is made an Exhibit in this case?

*Answer.* I do not know who made it, except by what I heard. I did not see the making of it.

*X Question No. 173.* Have you examined the said model, and can you state whether the distances, proportions, and sizes, carried out in it, are according to scale, and make the said model fairly represent the four-wheel cars used on said road in 1830 and 1831, and also the timber car alleged by you to have been used on said road in 1830, and also the wood car mentioned by you, used for carrying cord wood, as stated by you, in 1830 and 1831? If not, wherein does it differ?

*Answer.* I have examined the said car, but not by any measure or scale, but it is on the same principle as I have stated before.

*X Question No. 174.* Does the said model E fairly represent, in proportion, sizes and distances, the four wheel cars used on said road, in 1830 and 1831, and also the timber car, and also the wood car, as stated by you to have been used in 1830?

*Answer.* As near as it could be built, I think, according to my recollection.

*X Question No. 175.* How do you know that said model E represents the said cars used on said road, in relation to the distance between the trucks, since you have stated that you did not know the distance between the bolsters, and also between the standards, and also since you do not know whether the said model is according to scale or not?

*Answer.* My eyes do not deceive me in it, since here is all the principle of it, as near as any man can put it up. My eyes do not deceive me, I know.

*X Question No. 176.* Will you take this rule and tell me on what scale the said model E is constructed?

[Objected to by Defendant's Attorney.]

*Answer.* I cannot. I do not understand the scales.

*X Question No. 178.* What do you mean by the word or term principle? and would the principle of the said car, which the model E represents, be altered, in principle, by moving the bolsters nearer the middle of the car, as now placed, while the timbers on which the load rests, remained of the same length?

*Answer.* I call this the principle, that it vibrates through curves and switches, and the connection of them. I don't understand the meaning of the latter clause of the question. I wish you would explain it.

*X Question No. 179.* Would it alter the principle of the said car, represented by the model E by placing the bolsters of the timbers on which the load is placed, six feet nearer to each other, while the timbers on which the load was placed remained of the same length?

*Answer.* It would not alter the principle, in my opinion; the removing the ends of the timber further over the car would be more inconvenient.

*X Question No. 180.* In using the word principle as applied to said car, have you any reference to the distance at which the bolsters are placed from the ends of the timber on which the load rests?

*Answer.* We have. We never placed our timbers so as to run over the platform at the ends.

*X Question No. 181.* I ask you whether it would affect the principle, or be simply inconvenient, to extend the platform on which the load was carried one quarter of its entire length beyond the bolster on which it rested, and turned on the four wheel car?

[Objected to by Defendant's Attorney.]

*Answer.* I am not able to say.

*X Question No. 182.* What persons worked on the car Columbus, the body and running gear? Please give their names.

*Answer.* Francis A. Gatch, Reuben Aler, (he cut out the stuff from the rough for the bolsters,) John Rupp, John Eichelberger, the painter, Oliver Cromwell, Leonard Forrest, the blacksmith. That is all, according to my recollection, except the foreman — he gave his instructions.

*X Question No. 183.* Did Michael M. Glenn work on any part of the said car Columbus?

*Answer.* Not to my recollection. He was a man who worked sometimes in door and sometimes out; sometimes on the road, and sometimes in the shop.

*X Question No. 184.* Did Washington O. Frost work on the said car Columbus?

*Answer.* Not to my recollection.

*X Question No. 185.* Do you mean to state that the car Columbus was entirely finished and complete, when she went out on the road on the 4th of July, 1831?

*Answer.* I should not think she was. I should call her finished when she got the railing on and the awning on.

*X Question No. 186.* Was the Columbus so planned and constructed as to carry passengers on her roof or top of the car?

*Answer.* I should say she was, else they could not have fixed her for it.

*X Question No. 187.* Do you know what use Cromwell made of the drawing of the car Columbus you have spoken of?

*Answer.* I do not know anything about it.

*X Question No. 188.* Do you mean positively to swear that there was not a representation of running gear on the drawing you say you saw in possession of Mr. Cromwell, at the time the Columbus was building in one of the shops you have referred to?

*Answer.* I have positively already sworn that, to the best of my recollection, that I never saw any running gear under the said drawing.

*X Question No. 189.* Were the axles in the trucks of the Columbus at the same distance apart as in the four wheel cars at that time in use on said road?

*Answer.* As near as I can recollect, they were.

*X Q. No. 190.* Were any alterations made in the car Winchester, of which you have spoken, after she was put on the said road? if yea, what were the alterations?

*Answer.* I do not recollect of any.

*X Question No. 191.* Were any alterations made in the car Dromedary, after she was put on said road? if yea, what were the alterations?

*Answer.* I could not positively say whether she was completed when she was put on the road, or not; they generally used to take them out at times before they were finished.

*X Question No. 192.* Can you state for what purpose they were so taken out before they were finished?

*Answer.* The Company used to be scarce of cars, and I suppose they took them out to try them.

*X Question No. 193.* Do you mean to say they took them out to carry passengers, before they were finished, or to try the arrangements of the car, to see whether it would answer as a passenger car?

*Answer.* No; I say they would merely take them out to try them, and see whether they would answer.

*X Question No. 194.* Whom do you mean by the term "they," in your answers to the two last questions?

*Answer.* I mean the boss superintendents.

*X Question No. 195.* Who were the boss superintendents?

*Answer.* George Gillingham.

*X Question No. 196.* Was there, or not, another eight-wheel passenger car built at said shops, and placed on said road, for use, before the fall of 1834, called the Comet? and, if yea, describe it.

*Answer.* I could never recollect that car, although I have heard so much talk about it; I never could get that car in my mind.

*X Question No. 197.* In what respect did the car Dromedary differ from the Columbus?

*Answer.* The body of the Dromedary came down in between the trucks, within eight or ten inches of the rail.

*X Question No. 198.* Was there any other difference between the said cars?

*Answer.* Yes, there was considerable difference in the looks of them.

*X Question No. 199.* Which car carried its load easiest on the road? and why, if any difference?

*Answer.* I could not say.

*X Question No. 200.* You have alluded, in your direct examination, to certain eight wheel freight cars made by you, under contract with the said Company, in 1835; when you commenced to build these cars, under the said contract, was there in use, on said road, any other eight wheel freight cars, than the timber car and the wood cars which you have described, and which you say are represented in model E?

*Answer.* None, to my recollection.

*X Question No. 201.* What were the statements, descriptions, or explanations, given you, to enable you to estimate the kind, proportion, and cost of building the eight-wheel freight cars, which you contracted to build for said Company?

*Answer.* Mr. Gillingham gave me a kind of a sketch of the sizes, and the Company found all the materials—everything belonging to them—so that I was under no expense, other than doing the wood work and putting them on the road.

*X Question No. 202.* Did the sketch you refer to exhibit a car, and were the said cars built according to it?

*Answer.* I built the car according to the sketch, so far as there were alterations and improvements, we had to put them on to it.

*X Question No. 203.* Does the drawing now shown to you, marked "Plaintiff's Exhibit, No. 1," represent the cars built by you, under said contract, in 1835? if not, state the difference.

*Answer.* This represents a car like it, after it was completed, except the roof, which was a double pitch roof, and not circular, as represented in the drawing.

*X Question No. 204.* How long were the cars built by you continued in use on the said road, to your knowledge? and were they regarded as a valuable and useful car? if not, in what did the objection consist?

[Objected to by Defendant's Attorney.]

*Answer.* Some of them are on the road to this day, and they must be regarded as a valuable and useful car.

*X Question No. 205.* Were any of the matters herein enquired of you, of any interest to you, excepting such as grew out of this said contract?

*Answer.* I don't understand the question; there was nothing of special interest to me, in said matters.

*X Question No. 206.* Do you know of any other thing that will benefit or aid the Complainant, not herein stated?

*Answer.* I do not.

And the said Jacob Rupp, being re-examined on behalf of the Defendant, further says:

*Question No. 207.* At what time, in 1835, as near as you can recollect, was the first one or two of the eight-wheel freight cars built by you, under contract with George Gillingham, put upon the railroad, for use?

*A.* As near as I can recollect, it was in April or May.

*Q. No. 208.* At what time, as near as you recollect, in 1837, had you completed the one hundred and ten of these eight-wheel covered freight cars, under your contract, and delivered the last of them on the road?



A. As [as?] near as I can recollect, it must have been in April or May; it was early in the spring.

Q. No. 209. Will you look upon the drawing now before you, marked Defendant's Exhibit G, and say what it represents, to the best of your recollection?

A. This represents something that is near to the drawing that I saw in Mr. Cromwell's shop; this represents, as near as I can recollect, the drawing that I saw there, that the Columbus was built by.

Q. No. 210. Was the railing that was put around, or upon the top of the Columbus, after she had been run upon the road a short time, designed before or after she was put upon the road? state, if you know.

A. It was put on after she ran.

And the said Jacob Rupp, being further cross-examined on behalf of the Plaintiff, further says:

X Q. No. 211. Did you plan or design any part of the car Columbus?

A. I did not.

X Q. No. 212. Was not your reply, to the following cross-interrogatory, "Do you know what use Cromwell made of the drawing of the car Columbus, you have spoken of," in these words: "I do not know anything about it."?

A. That was my answer; I do not know anything about it.

X Q. No. 213. What do you mean by now stating that the paper marked Defendant's Exhibit G, was that from which the said car Columbus was built?

A. I would not say it was built by that drawing, but something similar to it; I wish to state that, from what I have seen, this drawing is similar to the drawing I saw Mr. Cromwell have at the time.

X Q. No. 214. Upon what work were you engaged in the fall of 1834? did you not work upon the wood-work of trucks intended for the Washington cars, so called?

A. We built several kinds of trucks in 1834, but I do not recollect now what road they were intended for; there was the Ohio road, and the Washington road; I recollect that I built some in 1835, for the Washington road; I recollect them, because I was so hurried.

X Question No. 215. Can you, and will you, state when said road was opened to Ellicott's Mills? please give the month and year?

A. I could not answer that question; I could give the year; it must have been opened in 1830 or 1831.

X Question No. 216. Can you state when any part of the road was opened for public business, commencing at Baltimore? if yea, state particularly.

A. I can state that it was partly opened, as far as the viaduct, and they used to run in and out from Mount Clare to the viaduct, in 1830, in April or May.

X Question No. 217. When was steam power first used on said road? please give the month?

A. I cannot recollect it.

JACOB RUPP.

Sworn and subscribed before me,

LEVIN GALE, *Commissioner*.

## 464 DEPOSITION OF CONDUCE GATCH, FOR RESPONDENTS.

Thereupon adjourned until to-morrow morning, the 21st day of April, 1853, at 10 o'clock, A. M.

On this 21st day of April, 1853, appeared before me, the Commissioner, William W. Hubbell, Esq., Attorney for the Defendant, Charles D. Gould, Esq., Attorney for the Plaintiff, and Conduce Gatch, a witness produced on behalf of the Defendant; and thereupon I proceeded to take the deposition of the said Conduce Gatch.

And the said Conduce Gatch (being of sound mind and) being by me first carefully examined and cautioned and duly sworn, according to law, to testify the whole truth, and being examined on behalf of the Defendant, makes oath, deposeth, answereth and saith, as follows, to wit :

### DEPOSITION OF CONDUCE GATCH.

*Q. No. 1.* State your age, residence and occupation, and how long you have been engaged in your present occupation ?

*A.* I am fifty-four years of age, I reside in the city of Baltimore, I am a millwright by profession, and I have been engaged in said occupation since 1817, with the exception of three or four years that I was employed by the Baltimore and Ohio Railroad Company.

*Q. No. 2.* State when your employment for the Baltimore and Ohio Railroad Company commenced, and when it terminated ?

*A.* I engaged permanently with them, in March or April, 1830, and it terminated in May or June, 1834.

*Q. No. 3.* State in what duties or work you were employed or spent your time within the time last mentioned by you, and where you so engaged ?

*A.* My duties were purchasing lumber and building cars of all the various kinds then used on the Baltimore and Ohio Railroad. I was so engaged at the shops of the Baltimore and Ohio Railroad Company; the shops were located at two different places; first at Mount Clare, and then at the corner of Camden and Charles Streets.

*Q. No. 4.* Name the persons, or as many as you can now recollect, who worked upon cars, in the construction and repair of them, at the Mount Clare shops, in 1830 and 1831 ?

*A.* I took a list off of my book : Washington Frost, Francis A. Gatch ; they commenced April 3d, 1830. Michael Glenn ; commenced to work 17th April, 1830. John Eichelberger, painter ; 11th June, 1830. Plummer Sank and Isaiah Terry ; commenced 3d April, 1830. Jacob Rupp ; 16th April, 1830. Oliver Cromwell ; 31st May, 1830. C. Baker ; 11th June, 1830. Reuben Aler ; 25th June, 1830 ; he is dead. Emanuel Eichelberger ; August 17th, 1831. John Rupp ; commenced April 25, 1831. Then there were six or seven laborers. I did not take their names.

*X. No. 5.* Will you name any others of the persons you have mentioned who are now dead ?

*A.* Francis A. Gatch is dead. Charles Baker is dead. That is all that are dead, that I know of.

*X. No. 6.* Will you state who had the superintendence or direction of the workmen you have named in relation to their work in the shops ?

A. That was my business entirely.

Q. No. 7. Will you state what kind of work Francis A. Gatch did, and who else worked with him in the same shop?

A. Francis A. Gatch and Jacob Rupp worked at the frame work or running gear of the cars.

Q. No. 8. Will you state what kind of work Michael Glenn did, and where he did his work?

A. He was a carpenter by profession, and worked in the same shop that Rupp and Gatch worked in; he frequently worked out, at fencing, making gates, and at repairing and putting up shops and buildings; also at the cars.

Q. No. 9. Will you state what kind of work Plummer Sank and Isaiah Terry did, and where they did their work?

A. Sank worked but a short time, and what time he worked there, he worked at the cars, and Terry assisted in laying down the first turn out and switches that were ever laid down on the road, under the direction of Mr. Whistler, I think, one of the engineers on the road; he also worked but a short time; Sank worked in the same shop with Glenn.

Q. No. 10. Will you state where Oliver Cromwell, C. Baker, Reuben Aler, and Emanuel Eichelberger, and John Rupp, worked? in which shop, or at what place, and with whom?

A. Oliver Cromwell worked in the coach shop, fronting on a line with the other shop—the shops being about three feet apart; a part of the time he had Francis A. Gatch with him; the rest of the time he worked alone; C. Baker worked in the shop with Glenn, and Jacob Rupp, and Reuben Aler, Emanuel Eichelberger, and John Rupp, also worked in the same shop with Glenn and Jacob Rupp; the shops were very temporary, and have been torn down since; the shops were at Mount Clare.

Q. No. 11. State what shop it was, and what kind of work they did; that is, the shop in which C. Baker, Reuben Aler, Emanuel Eichelberger, and John Rupp worked?

A. It was the car shop, where the car bodies and running gear was made; Reuben Aler was wheelwright, and worked at shafts principally; the others worked at car bodies and running gear.

Q. No. 12. Will you describe what kind of cars were built at those shops, at Mount Clare, in 1830? give a full description of them, stating the number of wheels and the mode of construction, and the uses to which they were applied, in 1830.

A. The cars built there were built with four wheels, the wheels from three to seventeen inches apart—that is, the flange; the framework constructed with two side pieces, or timbers, three cross pieces, bolted firmly together, with a perch piece, that the horses drew by, with four pieces for the body or platform to rest on; the platform cars or trucks were used for various purposes; the cars with bodies had falling doors on the sides, and were used for transporting different things; that is about all, I think; there were some cars used with two platforms connected, some with bolsters to haul long timbers, others with framework to haul cord wood.

Q. No. 13. Will you state the month and year, as near as you can recollect, when the platform cars or trucks were first used with bolsters to haul long timber?

A. I think it was the fall and winter of 1830? \*

Q. No. 14. In what month of 1830, as near as you remember, were the trucks used with bolsters to haul long timber, that is, the first car to haul long timber, and for what purpose were the long timbers hauled by it to be used?

A. I do not recollect the precise month they were first used in, but my impression is it was September or October,\* and they were used for hauling the long timber, string pieces, for the construction of the Baltimore and Ohio Railroad.

Q. No. 15. Will you describe the manner in which the bolsters were fixed or arranged, and the manner in which the long string pieces hauled by them, were placed or hauled?

A. In the first place there was an iron plate with a round hole in it, fixed permanently on the centre of the truck; a corresponding plate, with a round pin, about an inch and a quarter in diameter, fastened to the bolster; the bolster placed on the truck, with the round pin passing down through the plate attached to the truck; the bolster was prepared with standards to prevent the timber jostling off; the long string pieces were then placed on the bolsters, the pieces varying in length from twenty to forty-five feet.

Q. No. 16. How did the two four-wheel trucks act, or in what manner did they act, under this burthen, in going through switches and around curves?

A. In the first place, we were enabled, in the introduction of the trucks to these purposes, to bring the wheels closer together, or close together. In the construction of cars and the arrangement with the bolsters, the cars or trucks in motion passed easily through the switches and curves, the weight of the load being brought to a very small point or bearing, which previous to this time was not the case.

Q. No. 17. Do you mean to say that the arrangement of the bolsters allowed the trucks to swivel to suit the curves and switches, and pass through them?

A. I do; and change their position to any angle to the burthen.

Q. No. 18. Were persons in the habit of, or did persons get on the body of long timbers, as they rested on the bolsters, and by this means be carried along the road?

A. The drivers invariably rode on the timbers, and carried such of the hands as were permitted to ride on the burthen cars.

Q. No. 19. While these two four wheel trucks were thus arranged with bolsters, bearing one body or load of long timbers, and were thus in operation on the road, did the car develope or act upon the same combination or principle as the eight wheel platform, freight, and passenger cars now in general use on the railroads, or did it differ in operative principle?

A. The principle in relation to the running gear passing through switches and curves on the road, and its movement under the load, whether of passengers, coal, or lumber, or merchandise, is precisely the same.

Q. No. 20. Who originated or invented, planned, and gave the in-

\* See correction at the close of direct examination of this deposition.



structions for the construction of the timber car, in the manner you have described?

A. I done it myself?

Q. No. 21. You have said there were some cars used with two platforms, connected with bolsters, to haul long timber; others with frame work, to haul cord wood. In what month and year, as near as you remember, was the first one of such cars with frame work constructed and used to haul cord wood?

A. The winter of 1830-31; the precise month I cannot come at.

Q. No. 22. How many of such wood cars, that is, with the two platforms connected by a framing, were, as near as you can remember, in use in the winter of 1830-31?

A. As near as I can recollect some six or eight.

Q. No. 23. Will you now describe this wood car, in use in the winter of 1830, stating particularly the mode in which it was constructed and operated, and the mode in which the cord wood was placed and carried upon it?

A. The operation of the car on the road was precisely the same as under the long timber. The construction was made by placing two pieces of sufficient strength, about four feet apart, from out to out, on the bolsters, and bolting them fast to said bolsters, and morticing standards in those pieces, say sixteen to twenty feet apart, sufficient distance to carry two cords of wood, and placing the wood across, and against the standards, to prevent its falling off.

Q. No. 24. Will you look upon the model E, now before you, and say what it represents, and at what time, where, and for what, was it first used?

A. This represents the cars used on the Baltimore and Ohio Railroad, in the winter of 1830-31, to haul cord wood to the Mount Clare depot.

Q. No. 25. How early in the winter of 1830 was the first one of the cars represented by the model constructed?

A. I do not recollect the precise month, but my impression is that some were made in December and January.

Q. No. 25. For what purpose different from carrying wood, was an eight-wheel car built at the shops, next after the wood cars like model E had been running on the road? Name the car also, if she had a name, and state when the construction of her was commenced.

A. [The witness here looked at a paper in his possession, which he took from his pocket.]

A. In March, 1831, I purchased the lumber for a car, afterwards called the Columbus, and soon after commenced to build the same. This car was intended for carrying passengers.

The Commissioner having entered on the face of the deposition, the words, "The witness here looked at a paper in his possession which he took from his pocket," at the request of the counsel for the complainant—

The Defendant's counsel objects to the entry, on the ground that he, the counsel, does not know the contents thereof, and has not yet offered the same in evidence, and the Commissioner had no authority to make the entry, it being proper subject for the Complainant's counsel on cross-examination alone.

[Here a recess was taken until 4 o'clock, P. M.]

Q. No. 26. Will you produce and file with the Commissioner, the paper to which his entry refers? and state what it is?

A. [The witness here produced and handed to the Commissioner the paper herewith returned, marked Exhibit H, and put his name upon the same.] It is a memorandum of names of the hands employed by me when I was engaged by the Baltimore and Ohio Railroad Company, and dates of the time they commenced work, and two items of lumber purchased for the building of the Columbus, and the price paid.

Q. No. 27. Does that paper contain the date or time at which you purchased lumber for the Columbus?

A. Not the precise date.

Q. No. 28. At what time was the Baltimore and Ohio Railroad finished or opened to Ellicott's Mills, as near as you remember?

A. The summer of 1830.

Q. No. 29. At what time was the first eight-wheel timber car first used on the road in hauling the string pieces for the construction of the road?

A. In April or May of 1830.

Q. No. 30. Can you recollect about how many of these eight-wheel timber cars were used for hauling string pieces for the construction of the road in the spring and summer of 1830?

A. I do not recollect the number; the number was increased from time to time as there was necessity for them, and the road advanced.

Q. No. 31. At what time was the first eight-wheel wood car, such as is represented by model E, first used on the road in carrying cord wood?

A. The winter of 1830-31; they might have been prepared prior to the winter months, possibly they were.

Q. No. 32. What was the gauge of the track of the Baltimore and Ohio Railroad, in 1830, 1831, 1832, 1833 and 1834?

A. Four feet nine inches was, I think; we made a great many gauges for the men on the road.

Q. No. 33. Before you were permanently engaged with the company in building cars and the duties you have mentioned, were you employed on the road in any way? if so, when and in what duty?

A. I was; principally in repairing cars; I mentioned the time, I think; it was in 1829-30, through the winter.

Q. No. 34. With the first cars used by the officers of the Company, did they run them in 1829 with the flanges of the wheels on the out-sides of the rails?

A. I saw but one experimental car that was made in that way.

Q. No. 35. Was there a blacksmith's shop at Mount Clare station, and who worked in it?

A. Yes, there was one; I had it built; Leonard Forrest was the principal smith; he had a helper, a colored man, by the name of Parraway.

Q. No. 36. When did Leonard Forrest go to work there?

A. Some short time after I engaged with the Company; I don't know exactly the time; it might have been a month or two after.

Q. No. 37. Who designed or invented and had constructed the eight-wheel wood cars represented by model E?

A. They were built by my direction, and the order of George Brown, who was superintendent at the time.

Q. No. 38. Who designed or invented them?

A. They were designed by me; as to the invention I don't suppose there was any invention about it. I had the privilege from the President and Mr. Brown, the officer in charge, to make any improvement that suggested itself to my mind.

Q. No. 39. Is the use of such eight-wheel cars, or similar cars continued since that time on the Baltimore and Ohio and other railroads about Baltimore?

A. There are cars for conveying wood to different points still in use,\* and also cars called gondola cars, with sides twelve to fifteen inches high, that vary but little in their structure, simply a bottom and sides to them.

Q. No. 40. Will you describe the eight-wheel car for passengers, called the Columbus, and say when she was completed and first put upon the road?

A. The running gears of the Columbus were put together very nearly in the same manner that the common trucks were put together; two side pieces and three cross pieces, the centre cross piece made of locust, obtained about the shape required to give strength, that shape formed by the natural growth of the stick, and an inch rod directly under the centre cross piece; the best timber was selected and a better finish put on the work. The body, I think, was about twenty-four feet long and about seven feet wide, I think; the ends were made octagon shape, the doors were placed diagonally; the timber that took the weight under the body was about six feet from the ends. The body was composed of two bottom rails for the outside and two lighter rails inside, for the floor to rest on; the uprights were about two feet, from centre to centre, to let the slides and sash work in between; the connections between the trucks and the body were made by an iron plate on the centre piece of the truck, and a corresponding plate on the bearing timber under the body, and a bolt passed down through the floor and through the timber bolsters. There was also a circular piece of wrought iron to work on rollers inserted in the bottom bolster, to prevent the body from careening over to one side too much. She was completed on or about the 4th of July, 1831, and put on the road at that time; the mechanics that were employed on her rode out on her, I think, on the 4th of July, 1831.

Q. No. 41. In what way was the Columbus drawn?

A. By what was called a perch piece, bolted down firmly on the three cross pieces or cross timbers.

Q. No. 42. Under whose instructions and directions was the Columbus built, and who made or furnished the plans or drawings, and how or upon what were they made?

A. It was built under my directions. I furnished the drawing for the running gear, or trucks. I made the drawings on a board, the scale of an inch and a half to the foot. I purchased all the lumber, and gave directions to all the mechanics that worked on her. There was handed to me a drawing of the outlines of the body, merely two lines showing

\* See correction at the close of the direct examination of this deposition.

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the bottom rail, and two the top; two lines to represent the uprights, colored yellow, between the lines. I do not know whether the drawing was handed to me by Mr. George Brown, or by whom. There was no direction connected with the body, or the drawing, and no figures, to show the size of anything about it. That is about as near as I can come at the answer.

*Q. No. 43.* Had that yellow drawing of the body any running gear upon it, at that time?

*A.* No, sir.

*Q. No. 44.* Had that yellow drawing of the body any railing upon top of it, at that time?

*A.* No, sir.

*Q. No. 45.* Who worked from the drawings of the running gear that you made upon the board?

*A.* Jacob Rupp was the principal hand; and Francis A. Gatch, and, I think, John Rupp assisted him.

*Q. No. 46.* To whom did you give possession of the yellow drawing of the body, and who worked from it, if any one?

*A.* The drawing was in my possession whilst we [we?] were at work upon the car; it was placed in a chest of Oliver Cromwell, for safe keeping, but no work done without my directions.

*Question No. 47.* Did any one work from that yellow drawing of the body, in building the body under your directions? and, if so, who was it?

*A.* I do not know that there was any attention paid to the drawing, more than to give the outlines of a body; I do not know that it was drawn to a scale, as there were no directions or dimensions with it.

*Q. No. 48.* Who worked upon or built the wood work of the body of the Columbus?

*A.* Oliver Cromwell was the principal hand; and Francis A. Gatch and Henry Lybrand, I think, also worked on it; Gatch I know did, and Lybrand I think did.

*Question No. 49.* Who did the iron work for the eight-wheel wood cars, and for the Columbus?

*A.* Leonard Forrest.

*Q. No. 50.* Who painted the Columbus?

*A.* John Eichelberger.

Thereupon adjourned until to-morrow morning, the 22d April, 1853, at 10 o'clock, A. M.

On this 22d day of April, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner, Wm. W. Hubbell, Esq., Attorney of the Defendant, Charles D. Gould, Attorney of the Plaintiff, and the witness, Conduce Gatch; and, thereupon, I further proceeded with the deposition of said Gatch, as follows:

*Q. No. 51.* What position or office did Mr. George Brown hold, and during what years, as near as you remember or know, in the service of the Company?

*A.* He held the position of superintendent of the car building, and improvements generally about the depot; he was there in the years 1830 and 1831, I believe; he acted without a salary, I believe.



Q. No. 52. Who filled the same position next after George Brown? and is the person whom you may name living?

A. Mr. George Gillingham filled it, now deceased.

Q. No. 53. Who was the chief engineer of the road in 1830 and 1831, and for several years afterwards?

A. Mr. Jonathan Knight.

Q. No. 54. When the car Columbus was first put on the road, had she a rod around the top? if so, describe the height, and the manner in which it was secured, and the purpose for which it was put there?

A. There was an half inch rod extended around the top, leaving two openings for steps placed on the outside; the rod was about ten inches high, and passed through an eye on the top of an upright screwed fast to the top of the coach or car, merely to prevent trunks or baggage from falling off.

Q. No. 55. Was there any net work between the rod and the top of the coach or car at this time when she was first put on the road?

A. No, sir.

Q. No. 56. What were the steps outside put there for, and at what part of the outside of the car were they?

A. The steps occupied the diagonal corners from the doors; they were placed there for the convenience of putting up baggage, or for the driver.

Q. No. 57. Was a railing put upon top of the Columbus after she was first put upon the road; if so, state about how long after, and describe the kind of railing and the purpose for which it was put there?

A. There was. The railing placed, or rather uprights to secure an awning, it was not a railing, and the net work some two feet high connected with the uprights around; it was put there for the purpose of securing an awning for the comfort of passengers on top. The precise time the change was made, I don't know.

Q. No. 58. You were not asked the precise time; you were asked about how long after; and please state, as near as you can recollect?

A. My impression now is that it was not done until the following spring. There was also a stair-way made to go up inside.

Q. No. 59. Will you state why your impression is that it was not done until the following spring?

A. July 4th, 1831, was the first time she was on the road; there were some few alterations made afterwards—made it late in the season, and the awning was not required.

Q. No. 60. When the Columbus was first put upon the road; was there a rod of iron extending from one truck to the other? if so, state how it was secured, what it was put there for; at whose suggestion, if you know; whether it was removed; if so, when, as near as you remember, and state the reason why it was removed?

A. There was a rod placed there to connect the trucks together; it was a small rod with an eye at each end passed over a hook or pin, I forget which; it was put there to secure the trucks together; it was ascertained that the trucks, in passing through the switches and curves, displayed off on the outer circle and required more length than on a straight line. I think it was a general order to connect all the cars or trucks, all the eight-wheel cars; that caused the rod to be placed there.

It was removed very shortly after the car started out; the reason was the same distance apart was not retained in all parts of the road between the cars or trucks.

*Q. No. 61.* Had you approved of that connection of the trucks in the eight-wheel cars, in use on the road, or had you said that it was useless?

*A.* I did not approve of it, and had told the drivers frequently that it was useless in hauling the timber.

*Q. No. 62.* Was that rod removed from the Columbus before or after the railing of net-work, or the net-work, was fixed around the top of the car?

*A.* It was removed before.

*Q. No. 63.* As a general thing, had the eight-wheel wood cars, in use on the road before the Columbus was built, represented by model E, a rod also extending from one truck or perch-pin to the other, under the body framing? or were they used without such rod?

*A.* They generally bored a couple of holes in a piece of board, and slipped it over the perch pin as a connection.

*Q. No. 64.* Was the hole in the board relatively to the size of the perch pin sufficiently large to allow the trucks to swivel to suit the switches and curves, or how was it fixed?

*A.* It was generally slipped on loosely, and the holes made large.

*Q. No. 65.* Supposing the centre-pivot of an eight-wheel car to break; was there any intention, in such case, in ordering or having the rod or board there? and what was the intention or object?

*A.* That was the intention; the better security of the connection, in case of a breakage.

*Q. No. 66.* Do you know of the use of check chains, or connections, from the trucks, beside the connection with the centre-pivot, in eight-wheel cars, at the present day, to control the truck, and prevent it from turning round sideways, or getting away from under the body, in case the truck runs off the track, or the pin breaks? or have you no intimate acquaintance with their mode of construction, in this respect?

*A.* I have no intimate acquaintance with their construction, in that respect.

*Q. No. 67.* Do you know where Ross Winans was, or in what he was engaged, at the time you first constructed and first used the eight-wheel wood car, on the Baltimore and Ohio road, like model E?

*A.* I had no personal acquaintance with Mr. Winans; but I understood he was in England at that time, getting a patent for his friction wheel cars.

*Q. No. 68.* What other improvements, beside the application of the swivel principle to the two four-wheel trucks, under one body, did you invent and apply to the cars on the Baltimore and Ohio Railroad?

*A.* I invented and introduced the plain-ended springs, working in a cast iron pocket. I also invented and introduced shifting backs to the seats; the ring on the end of the axles for oiling the journals. The present brakes used on the road was an invention of mine, but was not introduced until after I left.

*Q. No. 69.* When the Columbus was first put upon the road what kind of seats had she in her? and describe whether she had to be turned round to make her return trip, and how and why it was done.

*A.* The seats, when first built, were placed lengthwise of the two

sides; and in the centre, back to back. When the change was made in the Columbus, they turned her on a swivel, end for end; it was done at a swivel, on the centre of two tracks, crossing at right angles; the foremost truck turned and run off on the right angled track, the other truck passing up to the swivel, and over on the straight line, the first truck being brought back to the swivel, and turned again to the straight line. It was necessary, in all coaches, at that time, where the driver's seat was at one end, and no shifting backs to the seats.

*Q. No. 70.* Did you apply your invention of the shifting backs to the Columbus, or to what car did you first apply them, and when, as near as you remember?

*A.* They were not applied to the Columbus. They were applied to other cars, in 1833. I do not recollect precisely the car; I think, perhaps, it was first applied to the Comet, or the Dromedary, or the Winchester—to some of those cars.

*Q. No. 71.* When the shifting backs to the seats first suggested itself to your mind, did you mention or describe it to any one; and if so, to whom?

*A.* Leonard Forrest, blacksmith, was the first man I named it to; and he made the work.

*Q. No. 72.* How long a time, within your recollection, was the Columbus used on the road for carrying passengers?

*A.* She was used from July, 1831, until I left the road, in May or June, 1834.

*Q. No. 73.* What was the shape of the top of the car Columbus, and for what reason was it made of such shape? and were the tops of four-wheel passenger cars also made of a somewhat similar shape; and had they also a rod along the sides, a few inches above the top, to keep baggage from falling off?

*A.* The top of the Columbus was arched, I suppose, some three or four inches, merely to pass off the rain, and was formed and prepared similar to the passenger coaches then on the road, with a rod around, to prevent baggage from falling off.

*Q. No. 74.* In 1830 and 1831 was there any general order as to the weight that should be allowed to be carried on the road as a load for every four wheels sustaining it? if so what was it?

*A.* There was a general order at that time that each four-wheel car should not contain more than two and a half tons of produce, or stone, or lumber.

*Q. No. 75.* Was this order tested for the eight-wheel wood cars used in the winter of 1830, as to the green cord wood?

*A.* There was an order given to ascertain the weight of a half of a cord of green oak wood. It was ascertained to weigh from twenty-five to twenty-seven hundred, which fixed the amount to be carried on an eight-wheel car.

*Q. No. 76.* Were any of the four-wheel cars called trucks provided with Winans's friction wheels?

*A.* I think not.

*Q. No. 77.* State what kind of cars Winans's friction wheels were applied to, and whether they required the wheels of the car to be further apart than the plain boxes did, and why they required said greater distance; and whether the use of them was continued, and if discontinued, why; or how did they wear or act?



A. They were applied chiefly to the four-wheel passenger cars; to some few cars for merchandise. The wheels were used further apart than most of the plain box cars. It was not necessarily so; but they passed easier through the switches and curves on account of a vibratory motion admitted to the axles by the friction wheels. They were discontinued; used but a short time; the friction wheels would stand still and wear through in a single trip from Ellicott's Mills, which rendered them very unsafe.

Q. No. 78. Why would they wear through very soon when they stood still, and the car was running?

A. The action of the weight was reduced to so small a surface on the end of the axle, that it soon got dry, heated the axle, and friction wheel being exposed to the grit and dust on the road, wore through.

Q. No. 79. When you took the four-wheel trucks to make the eight-wheel wood cars, did you select those which had the wheels nearest together, or those which had them furthest apart; or were they all about the same distance apart; and about what was the distance of those used for the wood cars, as near as you recollect?

A. The wheels under the trucks were about the same distance apart; they varied from three to ten inches, I suppose. The average of them, that is, the flanges, were that far apart. I don't know that we selected them particularly; all of them being sufficiently near to answer the purpose of passing through switches and curves.

Q. No. 80. Were any of the Winans's friction wheels used on the eight wheel wood cars?

A. I think not.

Q. No. 81. When the Winans friction-wheel cars were passing around curves, were the two axles of the wheel thrown out of parallelism with each other?

A. Yes, sir.

Q. No. 82. Were cars having Winans's friction wheels commonly called Winans's cars?

A. Universally, I believe.

Q. No. 83. Were the framings or bodies of the eight-wheel wood cars used in 1830, constructed for permanent use?

A. They were.

Q. No. 84. Did you build more of such eight-wheel wood cars in 1831?

A. Yes, sir.

Q. No. 85. Was the winter of 1831-32 a severe one, or very cold, and was considerable wood required for Baltimore, and to what extent did the railroad attempt to supply wood, and what kind of cars were used, besides the eight-wheel cars?

A. The winter of 1831-32 was a very severe winter, and a great deal of snow fell. There was a great amount of wood required, I can't say to what amount, but all the wood on the road that was offered they brought in pretty much. Box cars and trucks were used, prepared with standards, besides the eight-wheel cars.

Q. No. 86. Describe the manner in which the box cars had the wood loaded in them, and also describe the manner in which the trucks were used.

A. The box cars were used by placing standards at the ends, the



wood thrown in crosswise; the trucks were used by placing two pieces on the top of the trucks, lengthwise with the standards placed in them.

**Q. No. 87.** Did some of the eight-wheel cars used in the winter of 1831-32, carry more than one rank of wood; and, if so, say how they were arranged to carry more than one?

**A.** There were cars prepared for carrying two ranks or tiers, by placing four timbers lengthwise on the bolsters, and the wood thrown on from each side.

**Q. No. 88.** What other eight-wheel passenger cars were built while you remained on the road after the Columbus?

**A.** There were three; the Winchester, the Dromedary, and Comet.

**Q. No. 89.** Were they built upon the same principle as the eight-wheel wood cars and the Columbus?

**A.** In relation to the swivelling principle of the trucks passing through curves and switches under weight, they were the same.

**Q. No. 90.** Will you look at the drawing marked Defendant's Exhibit G, now handed to you, and say if you know what it represents?

**A.** It represents the outlines of a car body.

**Q. No. 91.** When and where did you first see such a drawing, or a similar drawing, and what became of it, so far as you know?

**A.** I had such a drawing in my possession from the latter part of February, 1831, I think it was; it remained in my hands for some two or three months; I do not know, then, what became of it.

**Q. No. 92.** Where did you get the drawing in the latter part of February, 1831, and where was it put for keeping?

**A.** I think I got the drawing from Mr. George Brown, and with it an order for a car to be built; I kept it for some considerable time in my possession; after the car was tolerably well under way, placed it in the chest of Mr. Oliver Cromwell.

**Q. No. 93.** Is that the same drawing, of which you spoke, as having placed in Oliver Cromwell's chest, in the former part of your testimony, that you referred to in your last answer as having placed in his chest?

**A.** It is.

[Recess until four o'clock, P. M.]

**Q. No. 94.** Will you measure the drawing marked Defendant's Exhibit G, and state the scale of its length and height relatively to the length and height at which the body of the car Columbus was built?

**A.** This is drawn to the scale of three-quarters of an inch to the foot.

**Q. No. 95.** Will you measure the model E, and state the scale of the length of the body framing, the distance at which the trucks are coupled apart, and the dimensions of the trucks, in relation to the wood car used in the latter part of 1830?

**A.** In reference to the length it is made of the scale of an inch and a half to the foot; the distance at which the trucks are apart appears to be about that—that is, an inch and a half to the foot; all the lengths seem to be on that scale; the dimensions of the trucks seem also to be on that scale, and the distance at which they are apart.

**Q. No. 96.** Will you measure the distance between the long body timbers that are bolted on to the bolsters to sustain the wood, and state

the scale of those two timbers apart from each other, in relation to the wood cars used in the latter part of 1830?

A. That would be two inches to the foot, in relation to that.

Q. No. 97. Do you recollect that Jacob Rupp told you that he had suggested a mode of drawing cars, that he was about to build for the Baltimore and Ohio Railroad? and if yea, state when you remember that he first told you, as near as you can, to whom he had made the suggestion or communicated the plan, and what he told you his suggestion was.

[Objected to by Complainant's Attorney.]

A. I recollect of his stating to me, in the latter part of 1834, or in 1835,\* whilst he was engaged in building some cars by contract, that he had proposed to Mr. Gillingham a plan for drawing the cars; he also described to me the manner; the manner was, to extend the bottom timbers out some two feet, or two and a half, bolt two pieces on firmly, one at bottom, the other at top, let the coupling-bolt pass down through, the coupling itself passing between.

Q. No. 98. The bottom timbers of what?

A. The body.

Q. No. 99. Will you state, as near as you can recollect, the distance apart of the wheels in each truck of the Columbus, between the flanges, and the diameter of the wheels? and whether, when she was first put on the road, she had the Winans friction wheels on, for the journals to run in? and whether the friction wheels were taken off, and plain boxes put on?

A. The distance, I think, was about from twelve to fifteen inches apart, in the flanges; the diameter of the tread of the wheel about thirty inches; I believe that was the way she was built, with Winans's friction wheels; but they were found too weak and unsafe for the load that was placed on her generally; a change was then made to plain boxes.

Q. No. 100. Will you state the diameter of the wheels of the eight-wheel wood car, used in the latter part of 1830, as near as you can recollect?

A. They were the same, I think; thirty inches in the tread; there was no difference, I think, in the wheels then used.

Q. No. 101. Did you know a person by the name of William E. Rutter, in 1830 and 1831? if so, when and with whom was he employed?

A. I was acquainted with him; he worked with Messrs. Buddy and Colvin, at the corner of Howard and Pratt streets, at the northwest corner, and, I think, served his time with them; apprenticeship, I mean.

Q. No. 102. Had the trucks of the eight-wheel wood cars breaks on them?

A. Yes, sir; one truck, out of the two, generally had a break.

Q. No. 103. Do you know what Ross Winans was employed in doing, in the year 1831?

A. I understood that he was engaged in getting up machinery, and some heavy framing, for stationary power, at the summit of Parr's ridge, for the purpose of passing the cars over.

Q. No. 104. Was it machinery for an inclined plane?

A. Yes, sir.

\* See correction at the close of the direct examination of this deposition.

Q. No. 105. Why did you not apply for letters patent, for the application of the swivelling principle to the two four-wheel trucks under one car body burthen or load? and also for the changeable seats, to allow the car to be run either end foremost, without turning the body? and also for the cast-iron pockets to receive the plain-ended springs working in them? what were your motives or objects in producing these improvements on the Baltimore and Ohio Railroad?

[Objected to by Complainant's Attorney for irrelevancy.]

A. I considered myself permanently employed by the Railroad Company, and conceived it to be my duty to do all I could for the interests of the Company and community.

Q. No. 106. Did Ross Winans direct you to apply the two four-wheel swivelling trucks under the wood car body, or under the body of the Columbus?

A. The application, with reference to the wood cars, was made before I knew anything of Mr. Winans much, and whilst he was in England; the application of the same principle to the Columbus, was made by myself, growing out of the former experiment.

Q. No. 107. I ask you, did Ross Winans direct you to apply the two four-wheel swivelling trucks under the wood car body, or under the body of the Columbus? answer, in addition to your former answer.

A. He had no authority to direct me at all, and I received no orders from him.

And the foregoing deposition having been by me read to the witness, Conduce Gatch, and he desired to correct any errors therein, when I came to the question, "Will you state the month and year, as near as you can recollect, when the platform cars or trucks were first used with bolsters, to haul long timbers?" and the answer thereto, "I think it was in the fall and winter of 1830," the said Conduce Gatch said: "I made the answer too late in the year; it should have been April or May of 1830;" and, in answer to the question next following, (which was then read to the witness,) "I should have said April or May, instead of September or October, was the first introduction of those cars for the Company's use."

And when I came to the question, "Is the use of such eight-wheel cars, or similar cars, continued since that time, on the Baltimore and Ohio and other railroads about Baltimore?" and that portion of the answer thereto, in the following words, "There are cars for conveying wood to different points, still in use," the said Conduce Gatch desired to add to the answer the words: "Of the same make."

And when I came to the question, "Do you recollect that Jacob Rupp told you that he had suggested a mode of drawing cars, that he was about to build, &c.," and the answer thereto, the witness desired so to correct the first part of said answer, as to read: "I recollect of his stating to me, in the latter part of 1834, or in the early part of 1835."

CONDUCE GATCH.

LEVIN GALE, *Commissioner.*

Thereupon adjourned at the request of Charles D. Gould, Esquire, Attorney for the Plaintiff, until Monday week, the second day of May, 1853, at ten o'clock A. M., for cross examination of the witness, Conduce Gatch, and to allow the said Charles D. Gould to procure from

Albany, an alleged original drawing of the car Columbus, and other alleged original drawings.

On this second day of May, 1853, at ten o'clock, A. M., appeared before me, Levin Gale, the Commissioner, William W. Hubbell, Esquire, the Attorney for the Defendant, and the witness, Conduce Gatch, and Charles D. Gould, Esquire, the Attorney of the Plaintiff, not appearing, a recess was taken until two o'clock, P. M.; and at two o'clock, P. M., the said Charles D. Gould not appearing, nor any Attorney of the Plaintiff appearing, nor the said Plaintiff himself, and the Commissioner being compelled to attend the Court of Appeals, of Maryland, held at the city of Annapolis, on tomorrow, the third day of May, 1853, adjourned until the fourth day of May, 1853.

On this fourth day of May, 1853, appeared before me, William W. Hubbell, Esquire, Attorney for the Defendant, and Charles D. Gould, Attorney for the Plaintiff, and the witness not being present, adjourned until tomorrow morning, the fifth day of May, 1853, at ten o'clock, A. M.

On this fifth day of May, 1853, at ten o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney of the Plaintiff, and Charles D. Gould, Esquire, Attorney of the Plaintiff, and the witness, Conduce Gatch, and thereupon I proceed with the deposition of the said Conduce Gatch, as follows:

*Q. No. 108.* Will you state what the king bolts of the first timber cars for hauling string pieces, that is, the eight-wheel timber cars, were made of, or what were used for king bolts for those first timber cars; or the first one of them?

*A.* An iron plate was used, about six inches square, with screw or bolt holes at the corners; the plate on the truck had a hole about an inch and a quarter in diameter in it, and the perch pin and plate was used on the bolster, the perch pin passing through the hole in the plate on the truck.

*Q. No. 109.* Did you obtain the perch pins and plates which you used for the king bolts on the bolsters, from the perches of four-wheel cars that were out of repair, or then about the shop? and if not, from what were they obtained?

*A.* The first were used from cars that had been broken; some little alterations perhaps had been made in them.

*Q. No. 110.* Look at the drawings marked Defendant's Exhibit I, and say what they represent, and what drawings any of the figures or parts are similar to?

*A.* Figures one and two represent the ground plan and elevation of the running gears of the car Columbus, and figure three represents an end elevation view of bolster and thorough brace connected with the same car; figure four represents the railing that was first put on the car Columbus, or top finish, to keep light articles from falling off, baggage and so forth. The drawings figure one and two are similar to the drawings I made on a board to build the running gear of the Columbus by.

*Q. No. 111.* Will you take the different figures of the drawing, one



by one, beginning with figure first, and describe the different parts by reference to the letters on them?

A. There are only portions of it on the drawings that are lettered; as far as they are lettered, I can. A A are the wheels, B the bolster, C represents the cross rod or bolt just under the bolster, D the perch piece the car was drawn by; those are all the letters on figure one. E E the rail of the road.

Figure 2; represented by the same letters, that is, the same portions are represented by the same letters, with the addition of G. G represents the rollers on the bolsters, and H the king bolt.

Figure 3. I represents an iron circular plate that worked on the rollers, K the movable bolster, L a leather thorough brace, M a circular piece connected with the body that sat on the thorough brace, N the bottom of the body—the main elevation view of the bottom of the body; H, I missed it, represents the king bolt.

Figure 4. O O represents two rods passing round and through the uprights, P the top of the body, R R the uprights, the rods passed through with scroll on top.

Q. No. 112. Will you look at figure 1 again, and find two small letters S, near the middle of each wheel; state what they are on?

A. S, S, are on the boxes or bearings of the car.

Q. No. 113. Will you state the time at which the Columbus first went on the road, with her running gear and the finish to the top of the body, the same as shown by the drawings to which you have just referred, marked Defendant's Exhibit I.

A. July, 1831.

Q. No. 114. What kind of boxes are those which she then had on, and which are shown by the drawing, figure 1, letters S?

A. What we call plain chill boxes.

Q. No. 115. Who made the bolts to fasten those plain chilled boxes on the running gear of the Columbus, that were there in July, 1831, when she first went on the road?

A. Leonard Forrest.

Q. No. 116. Who made the baggage rods and uprights that were on the Columbus in July, 1831, when she first went on the road, and the same as shown by figure 4, of the Defendant's Exhibit I, which you have just referred to? and who painted the same, if it was painted?

A. Leonard Forrest did the smith work, John Eichelberger painted it.

Q. No. 117. Were the plain boxes, letters S, S, that were on the Columbus, in July, 1831, and the baggage rods, removed, or had they any thing put in their place? if so, what was put in or used instead of them, and when was the change made, as near as you recollect?

A. The change of the baggage rods to net work and awning over it, was made in the, I think, next April or May following. The change to friction wheels, I cannot say whether it was the same season that the car was built, or at the same time the awning was put up.

Q. No. 118. You speak of the season, and use the words same season, in your last foregoing answer; what do you mean by the words "same season?"

A. The year she was built in—I should like to correct this answer,

I would like to alter it so as to make the answer—the fall or winter of that year, 1831.

*Q. No. 119.* Were the friction wheels that were put in when the Columbus was altered, or built with them, removed? and if so, what kind of boxes were again put on her?

*A.* The friction wheels were removed and side pieces also, and new chilled box something different in its construction from the first, was put on, and new side pieces.

*Q. No. 120.* Was this new chilled box considered what is called a plain box?

*A.* Yes, sir.

*Q. No. 121.* Had the friction wheels boxes enclosing them? State also how they were applied, how the side pieces of the truck were constructed for them, and whose friction wheels they were, or by what name known.

*A.* The friction wheels had not boxes enclosing them when they were first used on the road; the side pieces of the car were made generally out of ash timber, about four by eight, and mortice made through a little more than the size of the diameter of the friction wheel. The bearings of the friction wheel were on the under side of the side piece, and the friction wheel passed up through the mortice high enough above the side piece to receive the end of the axle on the inner surface of the bearing part of the friction wheel. They were called Winans's friction wheels.

*Q. No. 122.* Had the friction wheels boxes enclosing them, at any time? if so, state on what kind of cars, whether four wheel or eight wheel, they were first used; and when they were first used; and state also how they were applied; how the side pieces of the truck were constructed for them, and whose friction wheels they were, and whose boxes enclosing them, or by what name were they known?

*A.* There were boxes enclosing the bottom part of the friction wheels, used on a few of the four wheel cars. I do not know the precise time the boxes were introduced. The side pieces were made of two pieces; three by eight, I think, was the size, fitted up and bolted firmly together, and a mortice made in the centre, from the under side, with a circle corresponding with the periphery of the friction wheel, leaving room in the mortice for the friction wheel to work free. The half diameter of the friction wheel was then below, and a cast iron box was introduced, bolted on the side timber or frame, large enough to receive the friction wheel without touching. They were Winans's friction wheels. I do not know who introduced the boxes enclosing them.

*Q. No. 123.* Do you mean, in your answer, to say that the boxes enclosing the friction wheels, were first used on the four wheel cars?

*A.* I do not know. I don't recollect distinctly. They were never used on but one eight wheel car, to my knowledge; that was the Columbus; and they were abandoned altogether then.

*Q. No. 124.* Were the single side pieces that were in the trucks of the Columbus, when she first ran on the road, in July, 1831, and shown in figures 1 and 2, of the Exhibit I, removed, and double side pieces applied in the manner you have described, when the boxes enclosing the under side of the friction wheels were applied to her?

*A.* They were.

*Q. No. 125.* When the friction wheels were so applied with boxes enclosing them, did the upper portion of the friction wheel project above the side piece, or in what manner was the journal of the wheel axle brought in contact with the inner face of the friction wheel.

[Objected to as irrelevant by Complainant's solicitor.]

*A.* The friction wheel was enclosed by the side timber; the mortice, or cavity that it run in, not coming through the timber by about an inch and a half; an oblong hole was then made in the side piece, about two and a quarter by about two and three-quarters, through which hole the axle passed, and the inner surface of the friction wheel hung on the end of the main axle.

*Q. No. 126.* Were boxes enclosing the under side of the friction wheel, in use on any cars on the road, when the Columbus was running, in July, 1831, or were such boxes and such enclosure of the friction wheels introduced after the Columbus was built first, and running at said time, July, 1831?

*A.* I think it is possible there were some running at the time she was finished. I don't recollect that there was any on the road when we commenced to build her.

*Q. No. 127.* On what cars were the friction wheel boxes? or is it possible they were on, when the Columbus was finished, in July, 1831?

*A.* They were placed on cars for hauling flour from Ellicott's mills first—transportation cars. I recollect them.

C. GATCH.

*Cross Interrogatories to C. Gatch.*

*X Q. No. 128.* Who was the chief engineer of the said Baltimore and Ohio Railroad Company, whilst you were connected with it, and who were his assistants as Engineers of machinery.

*A.* Mr. Jonathan Knight was Chief Engineer when I first went there, in 1830. I do not know that there was any one particularly employed in that relation; I mean as assistant engineer of machinery.

*X Q. No. 129.* Was there any Engineer of machinery whilst you were connected with said road, and, if yea, during what period, and who was it?

*A.* There were two or three persons. Mr. Ross Winans was an officer under the President there. A man by the name of John Elgar, I think, was employed; afterwards Mr. George Gillingham, what their titles were, except Mr. Gillingham's, I don't know, he was Superintendent of machinery. I do not know what time they individually engaged with the company. I don't recollect. Mr. Winans was in England, I think, when I first went there. Mr. Elgar was working for Mr. George Gillingham, in Gillingham's own shop. Gillingham and Elgar became connected with the railroad company after I went there, sometime.

*X Question No. 130.* Did you see Ross Winans about the road and shops of said company, attending to the duties in the service of said company, in the year 1830? and if yea, how early in that year?

*A.* He was about the shops occasionally; the time, how early, I don't recollect.

*X Q. No. 131.* Did he give you any instructions or directions rela-



tive to work to be done in the shops under your control, in the years 1830 and 1831? if yea, of what nature were they? state fully.

A. Mr. Winans never at any time had any authority over me, that I know of. I received my instructions from persons immediately over me, Messrs. Brown and Gillingham.

X Q. No. 132. Question repeated to witness.

A. Not positively, to my knowledge, unless it was through the superintendent.

X Q. No. 133. Did you ever consult or take the opinion of Ross Winans, relative to the work being done in said shops?

A. I have no doubt but that our ideas and opinions may have been exchanged and expressed.

X Q. No. 134. What were the duties of Ross Winans, in the service of said company, during the years 1830, 1831, and 1832?

A. As far as I can recollect, his time was employed in trying to perfect his friction-wheel cars; and he had a young man who served his time with me, by the name of Isaiah Terry, making models for heavy framing for stationary power on the planes, getting up suitable machinery for the work, which work was done at West Point, I think, and having timber prepared at the ridge for heavy framing.

X Q. No. 135. Did he not furnish you with drawings for work to be done by yourself and hands, intended for use on the road?

A. I never had a drawing furnished me by any man while I was employed by the company, except the outlines of a car body, which was given to me by Mr. Brown, or some one else, I do not know who. My orders came through Mr. Brown.

X Q. No. 136. What were the duties of John Elgar in the service of said company, and did you receive any instructions or drawings from him for work to be done in said shops? and if yea, what were they?

[Objected to by Defendants' Attorney.]

A. Elgar was employed in laying down switches and turn outs. I never received any instructions from Mr. Elgar. As for drawing, at that time, I don't think he understood any thing about it. I made some patterns for Mr. Elgar, under his instructions, for himself; the company had nothing to do with them; intended for chilled outside bearings, outside of the wheels.

X Q. No. 137. Do you know of any experiments, made by persons in the employ of said company, on said road, with cars of the kinds in use, to determine the amount of friction on curves, and their operation in other respects? if yea, state under whose directions they were made?

[Objected to by Defendants' Attorney.]

A. I knew of a number of experiments that were made. There were experiments in reference to the friction of the different kinds of cars passing through the switches and curves. There was an experimental curve laid down on the common, on Stimpson's plan. My hands, I think, laid down the curve, under the direction of some of the engineers, I don't recollect who; all such work as that, not done under my supervision, was charged to whoever took the hands from the shop. Mr. Ross Winans and Elgar, I think, had the experimental curve laid down, upon Stimpson's plan. There were a number of experiments made on the road. The experiments made on the curve laid down on the common, was intended principally for curves in the



streets. The experiments on the road were generally made by the officers of the road.

X Q. No. 138. Will you please to state what officers you mean or refer to, as near as you can recollect?

A. I think I have seen Mr. Knight, Winans, Gillingham, and Brown, all attending to such matters.

X Q. No. 139. Had you any other duties than to superintend the work going on in said shops, and to obtain the materials which were required to be made up in said shops? if yea, state what they were.

A. I had no other than the building of the cars and obtaining materials, &c., for the various departments of the shops.

X Q. No. 140. Were the forms and proportions of the four-wheel burden cars used on said road, fixed and determined when you entered the service of said company, in April, 1830?

A. No, sir.

X Q. No. 141. By whom were the forms and proportions of the said four-wheel cars used on said road fixed and determined?

A. I did more of it myself than any other individual, I reckon.

X Q. No. 142. How soon after you entered the service of said company, were the proportions of said cars fixed and determined?

A. In relation to what? in relation to the running gear or trucks, or bodies, or what? the question is not definite enough.

X Q. No. 143. My enquiry referred to the four-wheel cars, as to their proportions.

A. Their proportions were fixed by the actual work intended to be done by them on the road; those proportions were mainly fixed in 1830 and 1831.

X Q. No. 144. What was the length of the platforms of the four-wheel cars, as they were adopted for use on said road?

A. Generally, I think, from seven to nine feet.

[Recess until four o'clock, P.M.]

X Q. No. 145. What was the size of the wheels used in four-wheel cars on said road, and what distance apart were the axles placed after they were adjusted, in 1830?

A. The diameter of the tread of the wheel, was, I think, thirty inches; and the distance between the axles varied from three to four feet apart, except Winans's; they were something further apart, I think.

X Q. No. 146. Who fixed the length of the bodies, and the distance between the axles, as you have stated?

A. I have not stated that there was any fixed distance between the axles; they varied according to the work they had to do, and the size of the body placed on them. The trucks for stone the wheels were brought quite close, and there were others further apart.

X Q. No. 147. Please state more particularly why the lengths and distances you have mentioned, relative to four-wheel cars, designed for said road, were of just the proportions you have stated?

A. Common platform cars for hauling stone would take a sufficient load, say two tons and a half—about what was required. Cars to carry lighter articles, the wheels were put further apart, so as to accommodate a larger body.

X Q. No. 148. State the reasons relative to the distance between the axles of the four-wheel cars?

[Objected to by Defendant's Attorney.]

A. My former answer embraces all, I think, that is in that question.

X Q. No. 149. In what position in a four-wheel car ought the wheels or axles to be placed to carry the load with the least disturbance.

[Objected to by Defendants' Attorney.]

A. I should suppose from forty-four to fifty-two inches axles apart, or the centres of the wheels—that is, if the wheels are thirty inches in diameter.

X Q. No. 150. Was it or not considered by you desirable to obtain as long a platform or body for four-wheel cars, as you could, having reference to the use to be made of it?

[Objected to by Defendant's Attorney.]

A. Our experience seemed to make the thing different in making bodies, say twelve feet long. Putting in a weighty article, and roll it to one end, it would tilt the car.

X Q. No. 151. What distance apart were the axles of four-wheel passenger cars?

[Objected to by Defendant's Attorney.]

A. At what period.

X Q. No. 152. When were four-wheel passenger cars used on said road, and during what period? and what distance were the axles of such four-wheel passenger cars apart, while so used?

[Objected to by Defendant's Attorney.]

A. They were used in 1830, 1831, and in 1832, I think. Winans's friction wheel cars were made the furthest apart, I think; from fifty to fifty-six inches, the axles were apart. The common cars varied, I suppose, from forty-four to fifty inches, from centre to centre, of the axles.

X Q. No. 153. Had any and what number of the four-wheel passenger cars plain boxes; that is, were they constructed, and what number, without Winans's friction wheels and box?

A. There were a number constructed with plain boxes; but I don't recollect the exact number.

X Q. No. 154. What distance were the axles, with plain boxes, apart, in the four-wheel passenger cars?

A. They varied, say from forty-two to fifty-two inches; there was no particular distance.

X Q. No. 155. How many passengers, with their baggage, were considered a load on the four-wheel passenger cars, in 1830 and 1831 and 1832?

[Objected to by Defendant's Attorney.]

A. Two tons and a half was a load for all kinds of cars; it depended a little upon the number of horses they had hitched to the car; sometimes they had one, sometimes two, and sometimes three; when they had a full load for three horses, there was from twenty to twenty-five passengers.

X Q. No. 156. When twenty-five passengers were carried on a four-wheel car, did a part of the load have to ride outside?

[Objected to by Defendant's Attorney.]

A. Some of the cars were prepared to carry passengers outside, and some were not. There were some of the cars that would carry from twenty to twenty-five passengers inside. The capacity of the cars

varied; some were coach bodies, entirely within the wheels; others extended out over the wheels, and were very wide.

*X Q. No. 157.* Were any four-wheel passenger cars in use, on said road, in 1830 and 1831, the bodies of which were not placed upon leather thorough braces?

*A.* Yes, sir, there were some.

*X Q. No. 158.* Will you describe such four-wheel passenger cars as were in use on said road that had not such thorough braces, and give the number in 1830?

[Objected to by Defendants' Attorney.]

*A.* I don't recollect the number. The bodies were very plainly made, with uprights and a top to them, that is all.

*X Q. No. 159.* Do you state confidently that four-wheel passenger cars were used on said road in 1830, which had not leather thorough braces to support the body?

*A.* I do.

*X Q. No. 160.* What proportion of the bodies of such four-wheel passenger cars extended beyond the axles, at each end of the car?

[Objected to by Defendants' Attorney.]

*A.* I suppose from two to three feet.

*X Q. No. 161.* Were four-wheel passenger cars built and finished in the shops conducted by you, in the year 1830?

*A.* I think there were some three or four.

*X Q. No. 162.* When four-wheel cars were built in said shops, did you control the proportions upon which said cars were built? if not, who did do so?

*A.* I did not always give the proportions; Mr. Woodville and Mr. Brown very frequently suggested the sizes; Mr. Woodville also suggested the kind of burden cars that were wanted on the road, or rather gave orders for them.

*X Q. No. 163.* In giving such orders for cars, did Mr. Brown or Mr. Woodville direct the proportions that should be used for cars, or simply that cars of such a kind should be made?

*A.* Simply that cars of such a kind should be made, and left the proportions and strength of cars generally with me.

*X Q. No. 164.* When four-wheel cars were built in said shops, did you control the proportions of them, as to the distance between the axles and length of platforms?

*A.* Almost universally I did.

*X Q. No. 165.* When were trucks or bearing-carriages first constructed in said shops, intended only to be used as part of eight-wheel freight-cars?

*A.* In April and May, 1830, we commenced preparing cars for hauling long timber.

*X Q. No. 166.* Do you claim to have invented an improvement in the construction of railroad cars? if yea, to whom did you first speak of it, and what led you to first think of it? state fully.

*A.* I had the privilege granted to me, from the officers of the railroad, the President, Mr. George Brown, and others, to make any improvement in the machinery on the road, provided I thought the improvement would be useful; and, being a regular machinist, and pattern-maker, and millwright, myself, I was better prepared to make improvements



than any other man in the concern; I therefore went on, made improvements, made patterns, whatever I thought would be useful to the Company; I first got up the lumber cars; the next were the cars for hauling wood; those I consider as my invention; the absolute wants of the Company led me to make the improvements, and I generally made my ideas known to the superintendent of machinery; it was not my business to communicate with anybody else about the matter.

X Q. No. 167. Who was then the superintendent of machinery? and where is such person, if living, now?

A. Mr. George Brown was first over me; and, after him, Mr. George Gillingham, until I left the service of the Company; Mr. George Brown is living now, in the city of Baltimore; Mr. George Gillingham is dead.

X Q. No. 168. State what you did after the lumber car was made, relative to your improvement—giving full particulars.

A. During the whole time I was there?

X Q. No. 169. State what you next did, after the lumber car was made, relative to your improvement, giving full particulars.

A. I still went on building cars of various kinds; you will have to state what improvement you mean; I have stated relative to the wood cars.

X Q. No. 170. Describe in what your improvement in the construction of railroad cars, having more than four wheels, consists.

A. I am still at a loss in the matter; for the question does not speak of burthen cars, or specify what cars are referred to; if he will specify what cars, I can answer.

X Q. No. 171. Did the improvement in the construction of cars for the transportation of timber on the said road, in 1830, exhibit all the advantages of the eight-wheel car at present in use, on said road? if not, wherein does it differ?

A. All the material advantages grew out of that, and some other improvements afterwards made by me; the principle of a car changing its position, passing through curves and switches, under any load, whether freight or passengers, is precisely the same as that in use now.

Thereupon adjourned until to-morrow morning, the 6th day of May, 1853, at 10 o'clock, A. M.

On this 6th day of May, 1853, at 10 o'clock, A. M., appeared before me, William W. Hubbell, Esq., Attorney of the Defendant, and Charles D. Gould, Esq., Attorney of the Plaintiff, and the witness, Conduce Gatch; and, thereupon, I proceeded with the deposition of the said Conduce Gatch, as follows:

X Q. No. 172. Please to state what parts or features of the timber car described by you as having been made by you in 1830, as your invention, is claimed in the letters patent of the Complainant, as his invention?

[Objected to by Defendant's Attorney.]

A. Have you his specification?

[The Plaintiff's Attorney here handed to the witness the two papers marked Plaintiff's Exhibits, No.'s 2 and 3. Defendant's Counsel objects to both of those Exhibits,—to Exhibit No. 2, because it is not a true copy, in full, of the drawing filed in the Patent Office; to Exhibit No. 3, because it is not a true copy of the specification, and contains



matter on its face not contained in the specification. Also objected to as irrelevant to the examination in chief.]

A. Am I to have reference to the drawing exhibited to me too?

[And being told by the Plaintiff's Attorney that he might refer to both the specification and the drawing, the witness further answers:]

I claim to have invented the running gears represented in the "Exhibit No. 2," with wooden bolsters—plain ended springs working in pockets—I claim that arrangement as entire, as far as the running gear. I claim to have invented and made the drawings entire for a car specified in "Exhibit No. 3," where the body hangs between the running gear and within about a foot of the rail. The running gear and connections being both the same in each case—the same construction.

X Q. No. 173. Please state in what parts or features of the timber car, as described by you, as having been made by you, in 1830, as your invention, is claimed in the Letters patent of the Complainant as his invention.

[Objected to by Defendant's Attorney: 1st, because it is irrelevant; 2d, because it is a repetition of the former question, and should have been given as a repetition, and not as a new question.]

[The above question was entered a second time, because it appearing to the Commissioner and the Counsel for the Plaintiff, that the witness had not fully answered the question; at the request of the Plaintiff's Counsel the Commissioner repeated the question to the witness, and thereupon the Defendant's Attorney insisted that the Commissioner should enter the fact that the question was repeated, which the Commissioner accordingly did, by entering the question a second time.]

A. The running gear, and the bolsters, and swivelling principle, which enables the four wheel car to move easily under the burden; it is precisely the same in principle with all other eight wheel cars used at that time, and which are still in use; the length of the body and the actual distance between the wheels varying,—not being essential to the principle involved.

X Q. No. 174. Please to state upon what peculiarities or features of construction the eight-wheel car, at present in use on railroads, for the transportation of merchandise and passengers, depends for its safety and usefulness; state fully.

A. The strength of the trucks, the strength of the body, the connections; that is all that is necessary, is it not?

X Q. No. 175. Please to state upon what peculiarities or features of construction and arrangement the eight-wheel cars, at present in use on railroads, for the transportation of merchandise and passengers, depends for its safety and usefulness; state fully.

A. I do not know that I can answer it any clearer than I have in my former answer.

X Q. No. 176. Do you, then, claim to have first invented the arrangement and construction of railroad cars, known as the Eight-wheel car, in general use on the railroads of this country?

A. So far as the running gears, and bolsters, and swivelling principle is concerned, to accommodate itself to any burden, I do.

X Q. No. 177. When did you first invent and arrange, in your own mind, the various features and parts which form and constitute the eight wheel car, at present in use on railroads of this country?

A. In April or May of 1830, I introduced the car for carrying lumber, long timbers, from twenty to fifty feet long; the following winter there were wood cars built on the same principle; and, in February or March, 1831, I planned and drew down the running gears for the first eight-wheel passenger car, worked from my own drawings; carried out my own ideas and plans, in those drawings.

X Q. No. 178. Will you state to whom, in 1830, or in the months of January and February, 1831, before making the drawings of which you speak, did you mention that it was your intention or desire to construct an eight-wheel passenger car, for use on said road, unlike any other passenger car then in use on said road?

A. I do not recollect that I——I made the drawing, and the plan was adopted, I judge, by Mr. Brown, at the time.

X Q. No. 179. Was the said eight-wheel passenger car, the first of the kind on said road, ordered to be built without a plan or drawing of it, having been first submitted to one or more of the officers of said road?

A. There was no plan of the running gears submitted at all, to the best of my knowledge, only what drawings I made myself; there was the outlines or sketch of a body, without any figures showing its proportions, or any arrangement for any of the finish of the car, something similar to this Exhibit marked Defendant's Exhibit G; that was all the drawing that I ever received whilst I was in the employ of the company.

X Q. No. 180. Had you any conversation with any of the officers of said road or company, relative to the construction of the said eight-wheel passenger car, before the said drawing, marked Exhibit G, was handed you? if yea, state with whom, and what said conversation was, as near as you can recollect.

A. I frequently conversed with the officers of the railroad, but to whom I conversed in relation to the eight-wheel car, particularly, I don't recollect.

X Q. No. 181. What officers of said road or company had the charge of the department in which cars were constructed?

A. Mr. George Brown, first; Mr. George Gillingham, afterwards.

X Q. No. 182. Did the four-wheel passenger cars, in use on said road, in 1830, answer the purpose for which they were intended, and used, and give satisfaction in use? if not, state the objections made to them.

[Objected to by Defendant's Attorney.]

A. They answered the purpose for which they were intended; there were defects in them, remedied by the introduction of the eight-wheel cars; the wheels being so far apart, they did not pass easily through the curves and switches.

X Q. No. 183. What object had you in view, or a remedy for what objection or difficulty did you seek to obviate, in the planning and construction of the said eight-wheel car? and was the said eight-wheel car called the Columbus?

A. Remedy an objection to what?

X Q. No. 184. What circumstance, or circumstances, led you to construct, or propose to construct, an eight-wheel passenger car.

A. In the first place, there was great difficulty in transporting the long string pieces, for the construction of the railroad, on the short

bodies and platforms of the four wheel trucks then in use, the timber being from twenty to fifty feet long; the cars from seven to twelve feet long. To remedy the difficulty, I prepared a plate of iron some six inches square, with a round hole in the centre, about an inch and a quarter in diameter; I then placed a similar plate on the underside of a bolster piece, and standards in it. This kind of fixture was prepared and placed on two trucks; the long timbers were then laid on the bolsters. The difficulty was then obviated, with relation to the timber. After that was done, the timber we then used was rather light for a middle cross piece, the weight coming directly on the centre. I introduced two cross pieces, to strengthen that portion of the car where the weight rested. The next eight-wheel car in order, was the wood car, model E, which had two long pieces bolted fast to the bolsters. In these long timbers, were standards near the end, which kept the wood from falling off. This gave rise—the introduction of these cars—gave rise to all of the improvements in eight-wheel burden and passenger cars, and gave me a correct idea what was necessary for the running gear of a passenger car.

*X Q. No. 185.* In constructing the cars for carrying cord wood, as stated and described by you, were any of the so called Winans cars used, or did the weight of the load to be carried on such wood cars, render it not proper to use them?

*A.* I do not recollect that there were any of Winans's cars used for that purpose, whatever.

*X Q. No. 186.* Was there any choice among the four-wheel cars, in use on said road, in 1830 and 1831, as to which among the burden cars should be used to make the car for carrying wood? if yea, state what features of such car led to its choice or selection.

*A.* We invariably used the cars that the wheels were nearest together, and when we made cars expressly for the purpose, brought the flanges up to within two or three inches of each other.

*X Q. No. 187.* When were four-wheel cars or trucks first constructed for use only under the permanent bodies, for the transportation of wood, freight, stone or merchandise?

*A.* Constructed for wood or freight, in the winter of 1830–31, permanently.

*X Q. No. 188.* Was there enough business offered to the said company, to be carried over such part of the said road as was finished, before the winter of 1830,–31, to keep constantly in use the freight cars then on hand, belonging to said company?

*A.* I do not recollect.

*X Q. No. 189.* Were the workmen employed in the shops superintended by you, kept employed, or was there much or little leisure time in which there was nothing for them to do?

*A.* I don't know of any leisure time; the hands I had employed were generally occupied.

*X Q. No. 190.* Was the arrangement of bolsters and timber spoken of by you, as having been used for transporting cord wood, carefully made, or was it regarded as a temporary contrivance, of which other use was made, by separating the parts when it was removed from the four-wheel cars, that such four wheel cars might be used for other purposes?



A. The centre pieces of the cars were made expressly for cars built for that purpose; the trucks could be used for other purposes, but that was not the design, as cars of the same construction are in use at the present day, on different roads.

X Q. No. 191. Was the frame of timber and bolsters ever removed from the four-wheel cars on which it was placed, to allow the four wheel-cars to be used for other purposes? if yea, about how often, as near as you recollect?

A. It is possible that some of them might have been; others were kept in general use.

X Q. No. 192. Please answer the last question more fully, and state what you mean by the last clause, "others were kept in general use."

A. There were some of the cars that were not altered, and were used with a connection, as model E represents. Others were taken off, there being more required in the winter season than in the summer season, of course.

X Q. No. 193. In what month of the year 1830 did you first arrange the cars with permanent frame of timber and bolsters to carry cord wood, and when? how soon after were others made?

A. If my memory serves me right there were some prepared in the fall months and through the winter, as they were required.

X Q. No. 194. Will you please state during which months of 1830, and how many during the fall and winter months before the first of March, 1831.

A. I cannot recollect how many were made, nor the precise month they were made in. I think some eight or ten were in use through the winter.

X Q. No. 195. How many were made before the winter—say before the first of October, 1830?

A. I cannot recollect.

X Q. No. 196. Do you state under oath that there was one made before the first of October, 1830?

A. Not positively.

X Q. No. 197. Do you state under oath that there was an arrangement of the kind described by you, for carrying cord wood, constructed during the months of October, November and December, 1830, and January, 1831?

A. I do.

X Q. No. 198. Upon whose order or at whose suggestion, was the arrangement of timbers and bolster which you claim to have arranged for carrying cord wood, made?

A. Mr. Woodville generally gave the kind of cars and quantity necessary. He was superintendent of transportation.

X Q. No. 199. Would you have made such an arrangement for carrying cord wood unless Mr. Woodville or Mr. Brown gave you directions, or assented to your making such arrangement, out of materials belonging to said company, and at the expense of said company, during the years 1830 and 1831?

A. Neither Mr. Brown or Mr. Woodville ever planned a car to my knowledge; when I received orders from them, it was to build cars suitable for the transportation of the commodities that offered on the road.

X Q. No. 200. Would you have made such an arrangement for



carrying cord wood unless Mr. Woodville or Mr. Brown gave you directions, or assented to your making such an arrangement, out of materials belonging to said company, and at the expense of said company, during the years 1830 and 1831.

[Objected to by Defendant's Attorney, as it is the same question that has been before answered.]

A. The arrangement of the car did not grow out of the order of the officers of the road; the timber cars suggested the arrangement, and, as I planned nearly all the cars that were then in use on the road, I planned and arranged the wood cars.

[The Commissioner, at the request of the Plaintiff's Attorney, now delivered to him a copy of Defendant's Exhibit G, and also of Defendant's Exhibit I. To which delivery the Defendant's Attorney objects, and protests against the same, denying the authority of the Commissioner to furnish copies of Exhibits without the consent of the party exhibiting the same.]

[Recess until four o'clock, P. M.]

X Q. No. 201. If, as you have stated, the length of the timber led you to arrange two four-wheel cars to be enabled to transport it on said road, what circumstance or thing led you to arrange the cord wood car with eight wheels, and a timber frame on which to carry the wood, as claimed by you?

A. The weight that was allowed to be placed on a single car was two tons and a half. A half a cord of green oak wood was weighed to ascertain its weight, so as to construct cars to hold the specified quantity of wood.

X Q. No. 202. Who gave the order relative to weighing wood of which you speak, and by whom and where was the weight of wood obtained? state fully.

A. Most likely the order came from Mr. Woodville; where it was weighed, or who weighed it, I cannot tell.

X Q. No. 203. Do you know of such an order having been issued by any body? State all you know about it.

A. There was an order of the kind issued, and there was a half of a cord of wood weighed?

X Q. No. 204. Will you oblige me by stating what more you know about it, if any thing?

A. I think I recollect the weight of the wood. It was some twenty-five or twenty-seven hundred for a half a cord of green wood.

X Q. No. 205. Will you please state all you know about the order relative to the weight of wood, stating also who communicated the order to you, or information respecting it?

A. The order was not given to me personally to have the wood weighed. The contents of a half a cord of wood in cubic feet defined the size of a car necessary to haul two and a half tons of wood, and that was all that was necessary; I meant two and a half tons for each car, five tons for a double car. I do not recollect who communicated the weight of wood.

X Q. No. 206. Were the two four-wheel cars used in forming each of the wood cars which you claim to have constructed, always connected by a strip of board when so used?

A. I think they were generally.

*X Q. No. 207.* How soon after you entered the service of the said company did you condemn the use of the Winans friction wheel on a railroad car? or how soon did you determine for yourself that it was not suited for that purpose?

*A.* I think the first car was a passenger car, it gave proof that it could never be brought into general use, but alterations and improvements were made after that, that made them somewhat more durable, by chilling the inner surface of the friction-wheel, and enclosing them in the side timbers and box. This was in 1830, during the summer, sometime, that I determined in my own mind that friction wheels would not answer.

*X Q. No. 208.* Did you invent the passenger car Columbus, the first eight-wheel passenger car used on said road? and state when and where she was built.

*A.* I commenced to build the Columbus, March, 1831. I designed the trucks and running gear, the bolsters, drew down the plan on a board, carried out my plan; the body was also built under my directions, from a side elevation view of the car, similar to Defendant's Exhibit G. She was built at the company's shops, at the Mount Clare depot.

*X Q. No. 209.* Did you first invent the passenger car Columbus as a railroad car? state fully.

*A.* All that I did was intended for that object specifically, and she was intended to run on the railroad by horse power.

The witness desiring to be allowed to absent himself until the 9th day of May, the Commissioner, with the consent of the Attorneys for both parties, adjourned until the 9th day of May, 1853, at ten o'clock, A. M.

On this 9th day of May, 1853, at ten o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esquire, the Attorney of the Defendant, and Charles D. Gould, Esquire, the Attorney of the Plaintiff, and the witness, Conduce Gatch, and thereupon I proceeded with the deposition of the said Conduce Gatch, as follows:

*X Q. No. 210.* Will you state how soon after you entered the service of said company you knew and fully understood that the nearer the axles of the four-wheel car were placed to each other the more easily it would pass through switches and around curves, requiring less power to draw it over or along the road?

[Objected to by Defendant's Attorney, as assuming conditions as facts not stated by the witness.]

*A.* In April or May, 1830, when the bolsters and lumber cars were used, I became fully acquainted with the fact, that the wheels placed from three to twelve inches between the flanges worked easier through switches and over the road on curved lines, than at distances further apart.

*X Q. No. 211.* When did you first construct cars for use on said road, for the purpose of passing through switches and around curves with the least friction practicable?

*A.* Some of the first four-wheel cars that were built, were built with platforms, the wheels varying from three to twelve inches; they were

first used as the lumber cars, for transporting long timber; from that period onward we built cars for that purpose.

*X Q. No. 212.* Were the bearing carriages used in the lumber cars, to which you have referred in your answer to the last question, specially constructed to pass around curves and through switches on said road with the greatest ease practicable under permanent bodies?

*A.* They were constructed without reference to permanent bodies, and where platform cars were built, wheels were placed close together, generally varying from three to twelve inches apart between the flanges.

*X Q. No. 213.* Were the bearing carriages used in the lumber cars, to which you referred in your answer to the last but one question, specially constructed to pass around curves and through switches on said road with the greatest ease practicable?

*A.* I think not, until the introduction of the lumber cars.

*X Q. No. 214.* Were the bearing carriages used in the lumber cars, to which you referred in your answer to the last question, specially constructed to pass around curves and through switches on said road with the greatest ease practicable, after the introduction of such lumber cars?

*A.* I don't understand the question.

*X Q. No. 215.* When were bearing carriages or trucks first constructed under your superintendence, and for use on said road in such manner, or of such proportions as to pass through the switches and around the curves of said road with the greatest ease under the load placed upon them?

*A.* Very early after I took charge of the shops there were platform cars made, they were all made, pretty generally made, with the wheels close together, and with that object in view that they should pass easy through switches and curves. It was between the time I engaged permanently with the company and April or May of 1830.

*X Q. No. 216.* Were the proportions of four-wheel cars constructed by you for the general business of said road, adapted to the cubic contents and weight of the load to be carried on them, or with reference to their passing with the greatest ease around the curves or through the switches of said road?

*A.* Some were constructed with reference to both; others were constructed with wheels further apart, to carry bulky articles, to give more room to the body.

*X Q. No. 217.* Would not a longer body than was placed by you in your longest four-wheel cars, have been of more or greater convenience in loading articles to be transported on said road, than the length that was adopted and used?

[Objected to by Defendant's Attorney as irrelevant.]

*A.* In some cases it would have been.

*X Q. No. 218.* What was the length of the longest four-wheel burden car body?

[Objected to by Defendant's Attorney.]

*A.* About eleven or twelve feet, I think.

*X Q. No. 219.* Of what length are burden car bodies, as now used on said railroad?

[Objected to by Defendant's Attorney.]

*A.* A majority of them, I think, are from twenty-four to thirty feet.

*X Q. No. 220.* When speaking of bearing carriages you have used the word, or term, trucks; do you mean by that word, or term, the ordinary four-wheel platform car in use at that time?

*A.* They were termed cars at that time, the term trucks has been given to them since, and, I think, should be applied solely to bearing carriages of eight-wheel cars.

*X Q. No. 221.* Were the four-wheel bearing cars used under the timber and wood cars, as spoken of by you, in 1830, always connected, when so used, by a strip of board?

*A.* I believe they were.

*X Q. No. 222.* Do you recollect a man named Hinks connected with the business of said road, in 1830 and 1831? if yea, please state his full name, and how he was employed, and whether or not in the service of said company; whether he is living; and if yea, where he is.

*A.* I recollect a man by that name; I don't recollect his full name, nor how he was employed by the company.

*X Q. No. 223.* Do you know a person called Browning? if yea, how was he engaged in 1830 and 1831, and what intercourse had you with him? and please state his name in full.

*A.* I know several persons by that name.

*X Q. No. 224.* Did any person of that name do any writing for you, or from your dictation? if yea, what was his name, and what did he do for you in 1830 and 1831?

[Objected to by Defendant's Attorney.]

*A.* There was a man by the name of William S. Browning, who kept a hardware store, with whom I dealt occasionally. As to his writing any document, I don't recollect that he did; he was not in the habit of writing for me.

*X Q. No. 225.* At what kind of work had Oliver Cromwell, of whom you have spoken, served his time, and at what special branch of work or business did he profess to employ himself, and for what special branch of work or business was he employed by said company?

*A.* He was a coach maker by profession, I believe. I employed him to do the work on car bodies, and make and repair shafts, and so forth.

*X Q. No. 226.* In using the two four-wheel cars for carrying long timber, as stated by you to have been done early in the year 1830, what prevented the car, to which the horses were attached to draw it, from drawing the foremost car from under the load?

*A.* The bolt connected with the bolster, principally.

*X Q. No. 227.* Did the timber, when carried on two four-wheel cars, as stated by you, slip on the bolsters endwise, or not, when passing around the curves and through the switches of said road?

*A.* I think not, sir.

*X Q. No. 228.* What idea or plan did you carry out, in making the drawings, as stated by you, in the following language, which you have used in this examination?—"I planned and drew down the running gears for the first eight-wheel passenger car, worked from my own drawings, carried out my own ideas and plans in those drawings."

[The witness was here referred to the answer from which the above quotation was extracted; and said answer, and the question to which it was a reply, was read by the Commissioner to the witness.]



A. The idea of an eight-wheel car involved in the carrying of lumber on two trucks, which made it essentially an eight-wheel car.

X Q. No. 229. Did the said car Columbus exhibit any new or other features or peculiarities than such as were present in the lumber car? if yea, state what they were.

A. The difference was principally in the construction. The idea of the trucks moving through the switches and curves under the load, and moving to almost any angle to the load or body, was carried out in the construction of the Columbus. The one was a passenger car, the other a lumber car; that is all, I think, that is necessary.

X Q. No. 230. Did any other person beside yourself have any controul or direction as to what parts should be put together, as to how the respective parts or the whole should be constructed, or as to how they should be combined, or as to the relative position of each part to the others, to form the car Columbus? if yea, state who such person was.

A. There was no person that had control over me in the arrangement, that I recollect of. I might possibly have consulted with persons that I thought knew something about it. I don't know that I can make the answer any clearer.

X Q. No. 231. Did any one direct that any special size or proportion of parts or things themselves should be used in forming and constructing the said car Columbus, so as to prevent your constructing said car as you thought best? if yea, state whom.

A. The drawing of the body handed to me, referred to heretofore, governed in some sort the dimensions of the body, but no dimensions were given in figures on the drawing; it was left for me to work out the matter as I best could.

X Q. No. 232. What other drawings of any part of said car Columbus, than that on the board from which the workman worked, and to which you have referred in your direct examination, did you make and exhibit to any one, and to whom did you exhibit it?

A. I don't recollect to have made any other drawings.

X Q. No. 233. To whom of the officers of said company did you exhibit the drawings on said board?

A. I suppose Mr. Brown, as he had charge then.

X Q. No. 234. Did Ross Winans, the Complainant, have anything to do with the choice and use of parts or things, the planning or construction of the car Columbus? if yea, state what?

A. It was said that he drew the body, or plan of the body, referred to. No further direction, to my knowledge, was given, as he had no authority over the shops whatever.

X Q. No. 235. What objection or difficulty attending the passenger cars in use did you seek to remedy in planning a car of a new arrangement and construction, and unlike any passenger car in use on said road?

A. The principal object was to build a car that would pass through the curves and switches with ease to the moving power, and any desirable length to the car, which remedied an unpleasant side or oscillating motion in the cars.

X Q. No. 236. What reason or thing induced you to place the con-

nection between the body and the trucks just in the position it was placed relatively to the ends and middle of the car body? state fully.

A. By placing one-fifth of the body over the bolsters and three-fifths between, four-fifths of the load was counterbalanced over the bolsters, one-fifth dead weight to act upon the strength of the body. Two-fifths of the load was counterbalanced by one-fifth of the length of the body projecting over the bolsters.

X Q. No. 237. Does the answer to the last question give the proportions, and state the position of the bolster under the body of the Columbus, as she was first constructed?

A. I believe it does.

X Q. No. 238. Is one-fifth of the length of an eight-wheel car body the best position at which to place the bearing carriages on which the body moves to carry the load to the best advantage on either a straight or curved road?

[Objected to by Defendant's Attorney.]

A. I do not know that it is.

X Q. No. 239. Why then, in the Columbus, as stated by you, did you place it there; that is, at a point one fifth from the end of the body?

A. Because I thought it best at that time.

X Q. No. 240. If you knew the advantage of placing the axles of a four-wheel bearing carriage close together, in the early summer of 1830, why did you, in constructing or planning the car Columbus, place the axles in the bearing carriages, forming a part of it, so far apart as you have stated they were?

A. I do not know that the flanges were over twelve to fifteen inches apart, and the difference would be but slight; it might possibly have grown out of the fact that all the other passenger cars were rather further apart, the Columbus being the first eight-wheel car, and an experiment, and a number of changes made; there was nothing definite settled upon it, at that time.

X Q. No. 241. Did you or not, when the said Columbus was planned, use your best judgment in continuing and constructing said car? state fully.

A. I expect I did, as far as my knowledge went at that time.

X Q. No. 242. If, as stated by you, you previously knew the advantage of leaving the bearing carriages or trucks, of an eight-wheel car, free to adapt themselves to the curves of the road on which it moved, why did you construct the said car with a perch which controls such free motion when the car is drawn by the perch, or the power communicated to it through the bearing carriages?

[Objected to by Defendant's Attorney, as assuming conditions and consequences as facts, not testified to by the witness.]

A. I do not know that the perch controlled the free motion; only in part, at any rate. The position of the horse was changed before the required change was to be made in the perch, or running gears; hence the power applied had a tendency to bring it to its proper position, having no trains of cars at that day.

X Q. No. 243. When the iron rod connecting the two bearing carriages was taken off of the said car Columbus, as stated by you, what was put in its place?

A. I do not distinctly recollect now, whether wood or iron connection was used.

X Q. No. 244. Do you assert positively, that anything was used in place of the said rod on said car Columbus? and if yea, for what special purpose did you apply something in place of said rod?

A. I do not recollect positively, but if my memory serves me right, there was a connection used with a link or oblong hole, to prevent, in case of breakage of the main bolt, an accident.

X Q. No. 245. Why were leather thorough braces used between the body and bearing carriages of the said car Columbus? state fully.

A. To prevent the unpleasant jar.

X Q. No. 246. In the first construction of the car Columbus, were or not the Winans friction wheels used? state particularly, and upon what circumstance or thing you rely, in making such statement.

A. She was first built, I believe, with plain boxes, afterwards a change made to Winans's; but how soon after I cannot recollect; the reason why his friction wheels were introduced at all, grew out of what they considered a very important improvement about that time, a double side and a chilled inner surface to the friction wheel itself, which was thought would remedy the defects which were before experienced; I rely simply upon my memory in reference to the matter; the chilling of the wheels was not known previous to that time.

X Q. No. 247. What do you mean by the last clause of your answer, "the chilling of the wheels was not known previous to that time?" the chilling of what wheels, do you mean?

A. Winans's friction wheels; the inner surface of Winans's friction wheels.

X Q. No. 248. Can you state when the locomotive engine was adopted as a motive power, on said road?

[Objected to by Defendant's Attorney.]

A. Not precisely; they were experimenting in 1832, 1833, and 1834.

[Here a recess was taken until 4 o'clock, P. M.]

X Q. No. 249. Can you state when the form of the body of passenger cars was changed from the post-coach body pattern to the form with square corners and straight sides, with sashes and glass to take the place of curtains? if yea, when was it?

[Objected to by Defendant's Attorney.]

A. I think there was one four-wheel car on the road previous to the Columbus being built, called Col. Long's car; that was the first car that I recollect of being made in that way; a four-wheel car, it was; there was another one made in the Company's shops, that I had charge of, directly after the Columbus, I think.

X Q. No. 250. When were trucks or bearing-carriages first constructed in said shops, under your superintendence, to be used under burden or freight cars, which were simply a frame of timber on wheels, without a flooring of plank on their upper surface?

A. I do not recollect; a very few of the burden or freight cars, with eight wheels, were used before I left the service of the company; that is, without the platform or plank covering.

X Q. No. 251. Had you a place in said shops under your superintendence, in which you kept your tools or papers, under lock and key? if yea, state what it was, and how secured.



A. I had a small desk, but no separate apartment.

X Q. No. 252. Was the desk you refer to a safe place for papers and statements of account?

A. As safe as a common writing-desk; a small writing-desk; it had a small lock and key to it.

X Q. No. 253. In what kind of work, stating particularly, had you been engaged, prior to entering the service of the said Baltimore and Ohio Railroad Company?

A. I carried on the millwright business; I worked some at repairing cars, and perhaps made some two or three.

X Q. No. 254. If any cars were made by you, for what company or railroad were they constructed?

A. I made a small car for Mr. Evan Thomas, the President's brother, to go on the Baltimore and Ohio Railroad; I made one other car, in a part of Mr. Gillingham's shop; that also went on the Baltimore and Ohio road; that was made with the first chilled boxes that ever were used on the road.

X Q. No. 255. Am I to understand you, that the cars you refer to, in the answers to the two last questions, were constructed by you before the month of April, 1830, or when were they built?

A. Prior to April, 1830.

X Q. No. 256. Had you any experience, and please state what, if any, in the use or operation of cars on railroads, before you entered the service of said company?

[Objected to by Defendant's Attorney.]

A. I had some experience in what repairs I had done for the said company, previous to being permanently engaged for the said company.

X Q. No. 257. By what part of the drawing you refer to as having been placed in your hands, early in the year 1831, and as represented by Defendant's Exhibit G, did you determine the scale and the dimensions upon which the car Columbus should be built?

A. I do not recollect whether any one part of it, more than another; by examining the proportions, I should judge you could come at the scale.

X Q. No. 258. What leading feature is there indicated in the said drawing, by which to judge of the dimensions of the intended car body?

A. Take, for instance, the bottom rail of the car; lay a rule on it; you can determine at once whether it is a quarter of an inch, a half of an inch, three-quarters, or an inch scale; then take other portions of the car; if they agree, that determines the scale they are drawn on.

X Q. No. 259. How can you determine, by laying a rule on the bottom rail, what the scale is, when you do not know the intended length or size of any single part?

A. If I know the proportions that will be required to give sufficient strength—when that was placed before me for a car body, I should determine at once it was not a quarter of an inch scale, for that would make it seventy-two feet long and upwards, and twenty feet high. A scale of a half inch to the foot would make it thirty-six feet long and ten feet high. Take three quarters of an inch to the foot, it would make it a fair length for a car body, say twenty-four feet and a half



long, about six feet nine inches high, which would be proper proportions.

X Q. No. 260. Does the said drawing indicate that the car was to be octagonal in shape, and that the doors were to be on angles?

A. It does not.

X Q. No. 261. Was the said car Columbus built octagonal shape, with the doors at the corners or angles? and if yea, why was she so built?

A. The ends were something near an octagon in shape, the doors at the diagonal corners. She was built so because we were not better informed in relation to car bodies; we did the best we could.

X Q. No. 262. What number of passengers was the said car designed to carry, as a full load, and how many would she carry?

A. She was designed to carry about forty, I think. After she was altered, and seats on top, she would carry fifty or over.

X Q. No. 263. Was she or not originally designed to carry passengers on top?

A. She was not?

X Q. No. 264. Were you or not examined as a witness for the defence, in the suit of Winans against the Troy and Schenectady Railroad Company, which was brought in the Circuit Court of the United States for the Northern District of New York, before John Carrere, Esq., U. S. Commissioner, in the year 1849? and if yea, did you have a drawing of the car Columbus then placed before you?

A. I was examined before Mr. Carrere, in what suit or what year I don't know that I recollect. There was a drawing brought there, said to be a drawing of the Columbus.

X Q. No. 265. Look at the drawing now shown to you, marked "Plaintiff's Exhibit, No. 4," and say whether it is not an accurate representation of the car Columbus, and also whether it is not the same drawing shown you and examined by you at the examination before John Carrere, Esq., above referred to.

A. It is certainly not a fair representation of the Columbus at any time while I knew her. There are portions of it that are. I possibly may have seen the drawing before; but it is far from a fair representation of the car Columbus when first finished.

X Q. No. 266. On the examination before John Carrere, Esquire, above referred to, did you not have the following question addressed to you: "Look at the drawing now shown you, marked A B, and say whether it is not an accurate representation of the car Columbus, to the best of your recollection; and if not, in what respects it is erroneous"? and if yea, was or not the following your answer: "I have looked at said drawing, marked A B, and, to the best of my recollection, it is an accurate representation of the car Columbus"? state fully.

A. If this drawing was ever before me, and that is my answer, the answer is incorrect. This drawing represents an upright studding of wood here, passing up some fifteen inches above the top, and a wooden rail around on the top some fifteen inches high. No such finish, to my knowledge, was ever connected to the car Columbus. The body alone, exclusive of the finish, is a tolerably fair representation.

X Q. No. 267. Did you or not, during the said examination before the said John Carrere, Esquire, have the following question addressed

to you : " When you built the car Columbus, as testified by you, were you not in the habit of consulting with George Brown, George Gillingham, and Ross Winans, in reference to said car, and was not the said Winans constantly going backwards and forwards, to and from the shop in which the car was built ? " and if yea, was not the following your answer : " I do not know that Mr. Gillingham was ever consulted, but Mr. Brown and Mr. Winans were. Mr. Winans was frequently in the shop when said car was being built " ? state fully.

A. I think it is very likely that was the question and answer.

X Q. No. 268. On the examination before referred to, before John Carrere, Esquire, did you not have the following question addressed to you : " Did not Mr. Winans direct you in the construction of the trucks of the Columbus, so far as his friction wheels were concerned ; and was not the use of the perch directed by him, or was it your own idea ? " and if yea, was not the following your answer : " The perch had been used on every car that was built, I believe. I do not pretend to say now whether Mr. Winans did or did not direct me in the construction of the trucks of the Columbus, so far as the friction wheels were concerned " ? state fully.

A. I expect that question and answer is correct.

X Q. No. 269. On the said examination above referred to, did you not have the following question addressed to you : " You have already stated that you did not put the wheels of the trucks close together, in the eight-wheel car Columbus, because of the employment of the Winans friction wheel. Will you look at the drawing, A B, now shown you, and explain in what manner the use of the friction wheel prevented your placing the wheels as close together as their diameter would allow ? " and if yea, was not the following your answer : " I have looked at the drawing, A B, and I do not know whether I am able to state why, in this case, the wheels were not put nearer together, but I suppose it was because other cars had been built in the same way " ? state fully.

A. It is possible that is correct.

Thereupon adjourned until to-morrow morning, the 10th day of May, 1853, at 10 o'clock, A. M.

On this 10th day of May, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney of the Defendant, and Charles D. Gould, Esquire, Attorney of the Plaintiff, and the witness, Conduce Gatch, and thereupon I proceed with the deposition of said Conduce Gatch, as follows.

X Q. No. 270. You have stated in this examination that you planned and constructed the car Columbus, excepting as to the form and size of the body, and that changes were made in the running gears of said car subsequently to her first going out, and that you controlled the construction and proportion of the four-wheel burden cars used on said road ; will you now state why, and by whose direction or order, the changes were made in the running gear of the said car Columbus ?

[This question being objected to, is withdrawn.]

X Q. No. 271. Will you now state why and by whose direction or order the changes were made in the running gear of the car Columbus, after she was first put upon the road ?

A. I worked under Mr. Brown's orders entirely, until Mr. Gillingham took charge.

X Q. No. 272. Did Mr. Brown direct that you should make the changes in the running gear of the car Columbus, after she was first put on said road?

A. Most likely he did.

X Q. No. 273. In the examination before John Carrere, Esquire, United States Commissioner, heretofore referred to, did you not have the following question addressed to you: "What, in your opinion, is the principle of the eight-wheel car now in general use; and was this principle in the car invented by you, as stated in your examination in chief?" and if yea, was not the following your answer thereto: "The principle of an eight-wheel car, I consider to be, in placing a frame work on the four wheels, and so connected with the body or load as to enable the truck or running gear to move with ease under the load, by the body resting on a point at the centre of the truck or running gear, the wheels being brought as near together as possible, so as not to touch, and placed at a proper distance from each end of the car or load; this enables both sets of wheels or trucks to move at any angle, from a right to a straight line. This principle was, in part, in the car Columbus, invented by me, with this difference, that the body and frame work were prepared for Mr. Winans's friction wheels, which, at that time, were too far apart to carry out the principle successfully and properly; I not having control entirely of the distance the wheels were placed apart. This was afterwards altered, and the wheels placed closer together. We certainly altered the boxes on the Columbus, and put the wheels closer together"? state fully.

[Objected to by Defendant's Attorney.]

A. I think there is an error in that answer. I should have been understood in that answer, that I had not control of the distance between the wheels in the Winans cars, or Winans friction cars; they were generally placed some fifteen inches apart at the flanges, fifteen inches or thereabouts. And the great reason why they were further apart, they passed through the switches and curves easier than other cars, on account of a vibratory motion the axles had, which gave the axles liberty to display on the outer circle. By the answer given before Mr. Carrere, it goes to show that the Columbus was built at first with Winans's friction wheels, which was not the fact. There were changes made afterwards, both in the running gear and body.

X Q. No. 274. In the examination herein before referred to, as having taken place before John Carrere, Esquire, was not the following statement adopted by you, as part of your answer in reply to the question which preceded it: "I recollect distinctly of the drawing of a body of a car, from which the body of the Columbus was made. The Plaintiff, I think, furnished said drawing"? And if yea, is the statement correct?

[Objected to by Defendant's Attorney, 1st, because the statement of the Commissioner, as appears by a printed copy of the said testimony, is in the following words: "The following, within parenthesis, inserted at the instance of Defendant's Counsel: (Here the Plaintiff produced and exhibited to the witness a drawing, and asked the witness if he had that drawing before him at the time he, the witness, constructed



the Columbus. To which the witness answered: "I recollect distinctly of the drawing of a body of a car, from which the body of the Columbus was made; the Plaintiff, I think, furnished said drawing. For the running gear, I made the drawings myself, to work by. The body built after said drawing, had a special reference to an eight-wheel car. There was the drawing of the body of a car came into my possession, which body, I think, was painted yellow. While said drawing was in my possession, I do not think there was any running gear attached to it." The Defendant's Attorney, therefore, objects to the question, because it does not contain the whole of the answer of the witness. And the further note, by the Commissioner, is in these words: "Here the Plaintiff was informed, that if the drawing then produced, was intended to be used for the purpose of examining the witness upon it, the paper must be filed with the Commissioner. Whereupon the Plaintiff said that he did not want the paper to go out of his possession, and would withdraw it, and declined any examination of the witness in regard to it, but at the same time, offered to allow a copy to be made and used, if the opposite party wished." The Defendant's Attorney, therefore, further objects to the question, as the said drawing, at the time offered, is not made a part of the present question, and the Defendant's Attorney calls upon the Plaintiff's counsel present, to produce the said drawing to the witness, as part of a legal question.]

[The Plaintiff's Attorney declines to file with the Commissioner, the drawing referred to, as it is already made an Exhibit in another case, now pending in another Circuit; and because there is already, in this case, an accurate copy of said drawing, see "A B" and offers to the counsel for the Defendant the privilege of having a copy made of the said drawing, so declined to be filed at the office of the Commissioner herein.]

A. Yes, sir; that is correct. I do not know that Mr. Winans made the drawing.

X Q. No. 275. Did the Complainant in this case, Ross Winans, hand you a drawing previous to the commencement of work upon the car Columbus, from which the said car, or any part of it, was built? and if yea, did you have any, and what, conversation with him respecting the construction of said car?

A. It is my impression that I received the drawing from Mr. George Brown, also orders to construct the car. It is possible I may have talked with Mr. Winans in reference to the matter, but what passed I cannot tell. He had no authority over me in the shops; no orders were received from him.

X Q. No. 276. In the examination heretofore referred to, as having taken place before John Carrere, Esq., was not the following question addressed to you—"You have stated that the Plaintiff furnished a drawing of a car body, from which the body of the Columbus was built. Had you, at that time, explained to him, or to any body else, your alleged invention, or had you, when he furnished the drawing, any conversation with him in regard to the position of the trucks, and if so, what was it?" and if yea, was not the following your answer—"I do not recollect the conversation which took place when Winans furnished the drawing"? state particularly:

A. That answer is incorrect, in so far as it goes to show that I had knowledge of his making the drawing. It was simply understood that



it was a production of Mr. Winans, placed in my hands by Mr. George Brown, I think, and the orders given at the time to build the car.

X Q. No. 277. In the examination heretofore referred to, as having taken place before John Carrere, Esq., was not the following question addressed to you—"Had you determined, or had you been ordered to build an eight wheel car before you received the drawing of the body from Mr. Winans?" and if yea, was or not the following your answer—"I had not"? state particularly.

A. That is a correct answer.

X Q. No. 278. In the said examination, heretofore referred to as having taken place before the said John Carrere, Esq., was not the following question put to you—"Did you ever ask the said Plaintiff or any one else, to furnish you with the drawing of an eight wheel car?" and if yea, was not the following your answer—"I did not. There was no necessity for it, because I could make a drawing myself"? state particularly.

A. That is correct, I believe. I would further add, that I did not know that Mr. Winans was capable of making a proper drawing. I had never seen any of his productions.

X Q. No. 279. In the said examination was not the following question addressed to you—"How came such a drawing to be furnished you if the invention was your own; and you had never explained it to said Plaintiff, or requested that you might be furnished with a drawing from him, or from any one else?" and if yea, was not the following your answer—"I do not know Mr. Winans's motive for bringing the drawing to me. I suppose he got authority from the company to do so"? state particularly.

A. I will make a little change in that—that he had authority from the company to make a drawing.

X Q. No. 280. In the said examination above referred to, was not the following question addressed to you—"You have seen the drawing shown you by the Plaintiff, on Monday's examination, and afterwards withdrawn by him, purporting to be the drawing of the model of the Columbus, built by you. State whether your recollection is distinct, that the running gear, as now shown on that drawing, was or was not in the drawing, before you constructed the running gear of the said car; and state what your testimony was on this point, on the trial of the case between Ross Winans and the Newcastle and Frenchtown Railroad Company, a case tried in the United States Circuit Court, for an infringement of Mr. Winans's patent of eight wheel passenger cars, spoken of in this case"? and if yea, was not the following your answer—"It has always been my impression that the body of the car, as it appears on said drawing, was alone on the drawing shown to me before the commencement of the building of the Columbus. The said drawing was some time in my possession. In said drawing the coloring of the running gear, and the execution of the running gear, are different from those of the body; and in my examination in the case referred to, my attention was drawn to this by some one who examined the said drawing during the trial of said case"? state particularly.

[Objected to by Defendants' Attorney, on the ground that the drawing referred to is not made a part of the question.]

A. That is correct.

X Q. No. 281. Does not the drawing, marked "Plaintiff's Exhibit, No. 4," accurately represent a drawing which was sometime in your possession during the year 1831, while the car Columbus was in course of building? if not, state all the particulars in which it differs, as near as you recollect?

A. It represents it in part—or I should have said, represents more than the drawing I worked from, by the running gears and finish on top. The body alone was all that I had to work from, and that a side elevation view. The doors of the Columbus were placed on diagonal corners; these here are represented both on one side. The upright studding here is represented to have run up through the edge of the roof with a wooden rail around on the top, some fifteen inches high. The uprights of the Columbus were framed into the top rail, as the present cars in use now show—the roof projecting over with an eave, so as to throw water from the body. I would not suppose that any man who knew his business would build a car in this way.

X Q. No. 282. Is the said drawing, marked "Plaintiff's Exhibit, No. 4," the drawing marked A B, which was before you at the examination before John Carrere, Esquire, above referred to?

A. I think that drawing was there; I am not positive, though.

X Q. No. 283. And is it the drawing which is referred to in the last interrogatory, as having been used by you in said examination?

A. I am not certain whether it was the original drawing or this.

X Q. No. 284. In the examination before referred to, did you not, among other statements, make the following statement or extract of a statement, in reply to a verbal question or questions, put to you by the counsel for the Defendant; viz.: "In the first passenger car that was made on this principle, the running gears or trucks were made by my drawings, under my directions, and I ordered and obtained all the materials necessary, at the expense, however, of the Company, (the Baltimore and Ohio Railroad Company.) I am little at a loss about the date, but I think this was in 1832, and I am pretty certain it was in 1832. After this, two or three other passenger cars were made on the same principle by my direction, and from my drawings; and all of them were made previous to October the first, 1834, the date of Mr. Winans's patent"? state particularly.

A. The dates are wrong, then; if it has reference particularly to the Columbus, as I judge it has, the balance is correct, I believe. I judge that is about the sense of the statement.

X Q. No. 285. In the examination, before referred to, did you not, on cross-examination, make the following statement in reply to questions addressed to you by the Plaintiff in the case: "I had the direction of the car-building, smith work, passenger car-building, and bought all the materials, pretty much, that were used; I kept all the time and paid all the hands under me, while in the employ of the Baltimore and Ohio Railroad Company. The first timber carried on eight wheels, on said road, was carried on two ordinary four-wheel cars, used for carrying stone. As to the date I cannot ascertain it, but so soon as we became acquainted with the advantages of using the eight-wheel car, we made the centre timbers stronger, and placed the wheels closer together; this was done in the latter part of 1831, or along through 1832, certainly in

one of those years or the other, and before the building of the eight-wheel passenger cars. At this time the moving power on said road was horse power. Some experiments in steam power were made. Up to the time of the construction of the first eight-wheel passenger car, the power was applied to the truck, and not to the body of the car, as it is at present. The trucks were coupled together (independent of the load) by a coupling bar, and not by a body, as at present; but before I left the road, the Columbus, (the first eight-wheel passenger car,) which was coupled by a coupling bar, had also a body for passengers placed on the trucks as a permanent fixture, and it strikes me, that this was the first eight-wheel car on said road, having a body as a permanent fixture"? state fully and particularly.

A. The date mentioned in that answer ought to have been 1830 and 1831, instead of 1831 and 1832. The statement is correct, as far as I can recollect.

[Recess until four o'clock, P. M.]

X Q. No. 286. Did you or not, on the 26th day of February, 1852, execute an affidavit in the case of Winans against Orsamus Eaton, et al., a case then and now pending in the Circuit Court of the United States for the Northern District of New York? and if yea, did you not make, among other things, the following statement: "The Plaintiff, Mr. Winan, had abundant opportunity of seeing the application of my principle; he was on the railroad, up and down, when it was in operation, and I suppose saw it in operation; my invention attained all the advantages mentioned in the specification of the Plaintiff (Mr. Winans's) patent, and all the advantages now derived from the use of the eight-wheel car, now in general use throughout the United States; I think the Columbus was the first eight-wheel passenger car on the Baltimore and Ohio Railroad, having a permanent body; I think that was built in the warm weather of 1831; I never at, or before the building of the Columbus, heard the Plaintiff, Mr. Winans, claim as his invention, the principle of the running gear of the Columbus, or of any eight-wheel passenger car; nor did I ever hear of his claim until after his patent was taken out"? state particularly.

A. That is a correct statement, I judge.

X Q. No. 287. Do I understand you, in reply to the last question, to state that you did execute the said affidavit with the extract above quoted therein?

A. As near as I can recollect, the statement is correct.

X Q. No. 288. After the completion of the car Columbus, in 1831, did you construct any other eight wheel passenger cars at said shops, under your superintendence? and if yea, state how many were so constructed, previous to your leaving the service of said company, in 1834; and if they had names by which they were known, please state such names, and the order in which the said cars were placed on the said road.

A. I did construct three other eight-wheel passenger cars. I recollect the names, but not distinctly, which went on the road first. The names were "Winchester," "Dromedary," and "Comet," I think.

X Q. No. 289. Did you plan the arrangement and construction of the said car Winchester?

A. I do not recollect.



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X Q. No. 290. Will you state the object of her construction?

A. I do not recollect now whether the car with three distinct bodies on, was the Winchester or Comet, therefore I cannot say what was the object of its construction.

X Q. No. 291. Will you state how she differed from the Columbus, in construction, or in proportions, or arrangement?

A. I do not recollect, as I stated before, which of the two cars was called the Winchester or Comet; therefore I cannot tell how they differed in arrangement.

X Q. No. 292. If you can state any thing about the said car, do so.

A. It is out of my power to give any statement in reference to said car unless I recollected which of the two cars was called Winchester.

X Q. No. 293. What circumstance or thing led you to plan and arrange the car Dromedary? state fully.

A. If I recollect right there were some accidents on some railroads in the country, from the breaking of axles, perhaps. It was thought by some of the officers of the company that a car body of a different construction would be safer. I was requested, I think, by Mr. George Gillingham, the superintendent of machinery at that time, to submit a plan to the consideration of the officers of the company. I did so, and the car was built under my direction.

X Q. No. 294. Was the said car Dromedary built on your own plans, according to your own ideas, and from your own drawings only? and if not, who was connected with you relative to the getting up of said car, and what part of it was your own exclusively?

A. It was built from my own drawings entirely. I never saw any drawing of the Dromedary, or any portion of it, except what I did myself. I might possibly have had ideas from other men, I cannot say now who; the general plan was my own.

X Q. No. 295. Will you state particularly in what particulars the said car Dromedary differed from the Columbus, in arrangement of parts, in the proportion of the respective parts, and in the relative position of the parts? State all you can about her.

A. There were two trucks, with a strong centre piece, and the body was formed with two sides or bottom rails; the bottom rails, after they passed the rear of the running gears of each truck, turned down between the trucks to within about a foot of the railroad. The side rail was secured at the turn by boiler iron riveted on, on each side. Her bolster was then firmly connected with the two side rails, say from four to five feet from each end, that rested on the middle cross piece or timber of the truck, through both of which passed the main or king bolt. The boiler iron, I think, ran along the entire length of the side rail.

X Q. No. 296. How much of that part of the car body of the said Dromedary projected over the bolster on the truck, or king bolt of the truck, in which persons sat?

A. A very small proportion of it went over the bolster; perhaps from three to four feet.

X Q. No. 297. Had the said car Dromedary any kind of railing, or any thing above that part of the body in which passengers sat? if so, state what it was.

A. I am not very certain as to the railing, but I judge there was some finish, perhaps of iron rods and small uprights, to hold baggage.



*X Q. No. 298.* How near were the wheels in each truck of the said car Dromedary, as compared with the car Columbus?

*A.* I think the wheels were placed somewhere from eight to twelve inches apart, that is, the flanges.

*X Q. No. 299.* Were any and what changes made in the said car Dromedary, to your knowledge?

*A.* If there were any changes, I judge they were made at the Mount Clare depot; she was built at the Charles street shops. There were no changes made to my knowledge; if there were any they were made at the Mount Clare depot. The shops there were not under my supervision at that time.

*X Q. No. 300.* Did the car Dromedary give satisfaction in use on the road? if not, what objection was found to her construction?

*A.* I cannot say whether she gave satisfaction or not; I was very seldom out on the road after I left the Mount Clare depot.

*X Q. No. 301.* Did the car Winchester give satisfaction in use on the road; or what objection was found to her construction or arrangement?

*A.* I do not recollect which of the other two cars were called Winchester; I have stated that two or three times.

*X. Q. No. 302.* Will you describe the car Comet, of which you have spoken?

*A.* If I knew which of the two was called the Comet I could describe it.

*X Q. No. 303.* Will you describe the eight-wheel passenger car, which you planned and constructed first after the Columbus, for use on said road?

*A.* I cannot do that, for I do not recollect distinctly what car was built next.

*X Q. No. 304.* What objection or difficulty was found to attend the use of the car Columbus, either in her parts, proportions, arrangements, or construction?

*A.* I think the principal difficulty was the want of springs. There were some other portions of it that was defective. The thorough brace could not be kept up, so as to operate effectually. There was a stairway placed inside of her, some six or nine months after she was built. We had an awning placed over her, and seats for passengers on top.

*X Q. No. 305.* Can you state any other objections which were found to attend the car Columbus, after she had been sometime used, arising out of her proportions or arrangements? if yea, state all.

*A.* My being removed from the Mount Clare depot, I had very little opportunity of knowing much about the cars in use on the road, the passenger cars. I judge she was abandoned on account of not being adapted to very quick speed.

*X Q. No. 306.* Will you now describe singly the two other cars, called the Winchester and Comet, without reference to the names?

*A.* One of them had three bodies, similar to coach bodies. There were two pieces placed on bolsters, and fastened firmly thereto, similar to model E. The bodies were fitted down into a concave, cut in the two timbers, and bolted fast to the said timbers. The other car I have very little recollection of at all.

*X Q. No. 307.* Can you not describe more fully the three bodied car, of which you have spoken? if yea, do so, as fully as you can.

A. In addition to what I have stated, I can only say, that she was placed upon two trucks; her construction I cannot recollect, precisely.

Thereupon adjourned until to-morrow morning, the 11th day of May, 1853, at ten o'clock, A. M.

On this 11th day of May, 1853, at ten o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, and Charles D. Gould, Esquire, Attorney for the Plaintiff, and the witness, Conduce Gatch, and, thereupon, I proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

X Q. No. 308. Are you not able to describe more particularly either the Winchester, the Dromedary, or the Comet; and is the "three bodied car," of which you have spoken, in your last answers, one of the three cars above named? state fully, with reference to the description of the cars.

A. The three bodied car was one of the three. I described it yesterday, as nearly as I could. I have also described the Dromedary. The other car I recollect but little about.

X Q. No. 309. Were all or either of these three eight-wheel passenger cars regularly used for the transportation of passengers, in trains, drawn by the locomotive engine, while you were connected with said company? and, if yea, state particularly all you know as to such use.

A. They were eight-wheel passenger cars, but how they were drawn, whether by horse-power, or locomotive power, I don't know.

X Q. No. 310. When these cars were drawn by horses, was such car connected with others, to be drawn by the same team, or was it regarded as a load, to be drawn alone? state fully.

A. I have no particular recollection how they were drawn.

X Q. No. 311. Can you state whether or not locomotive steam power was at the time in use on said road, when either of these cars was first placed on said road for use? and, if yea, which of them?

A. They were experimenting in locomotive power in 1832, 1833, and 1834. I think, in 1834, some successful experiments were made, from locomotives that were used.

X Q. No. 312. Can you state whether either of these three passenger cars was arranged to draw by the body? and, if yea, which of them?

A. I don't recollect that either of them was arranged to draw by the body, at the time they were first built.

X Q. No. 313. Will you state why you did not arrange one, or more of them, to draw by the body, if, as stated by you, that long previous to the construction of either of them, you understood, and had knowledge of the advantages to be derived from the free action of the trucks, when the car, of which the said trucks formed a part, was in motion on a railroad?

A. The work that I did was chiefly designed for horse power; the cars not intended to run in trains. After the introduction of steam, the connections were made from the bodies.

X Q. No. 314. Were all the alterations and changes made in these respective cars, and also in the car Columbus, during the years 1832, 1833, and 1834, done in the shops, by your directions, and under your superintendence? and, if not, state when other shops were established, and where such shops were located, and, also, who had charge of them.

A. Some changes were made in the Columbus, under my directions; none, to my knowledge, upon the other three or four cars, eight-wheel passenger cars that were built. The repairs were chiefly done at the Mount Clare depot, at the shops I formerly had charge of; my brother, Francis A. Gatch, had charge of them.

X Q. No. 315. At what time, as near as you can state it, did you give up the superintendence of the shops at Mount Clare depot, as stated by you?

A. I think it was in 1832, sometime.

X Q. No. 316. By whom was the model F, made an Exhibit in this case, constructed, and what did you design to represent by it, and does it accurately represent the contrivance which you have spoken of, as having been constructed by you, and put in use on said road, in 1830? state, particularly.

A. It was constructed under my directions; it represents the wood cars used in 1830; it represents the wood cars put in use on the road in 1830; I did not say anything about contrivance, that I know of; it is a railroad car, as much, in fact, as any other in existence.

X Q. No. 317. Do you mean to state that the wood car which you state it represents, was regarded by you and others as a permanent arrangement? the parts to be used only in the connection in which they were placed by you?

A. They were, some of them; and the same, in principle, are used to the present day, with some slight modification.

X Q. No. 318. State what you mean by the words "they were, some of them;" stating particularly which of them were intended to be used only in the connection in which they were placed by you.

A. There were some made permanently, and put in use, that were used for no other purpose previously or afterwards, to my knowledge; there were others that were put to work temporarily, from platform cars, that had been used on the road before.

X Q. No. 319. Is there the board connection, spoken of by you as connecting the two platform cars, in the model E? if not, why have you not placed it there?

A. That connection was very seldom placed there by the workman in the shop, if ever; it was only a temporary affair.

X Q. No. 320. Who, then, did place it there?

A. The drivers, or any person that had the use of the car.

X Q. No. 321. Was the said board, or connection between the platform cars, when the platform cars were used in connection, as stated by you, regarded as of any importance by yourself, or any one else? and, if any, what? state fully.

A. It was never regarded by me as of any importance; the connection was used in hauling timber, as much as anything, to draw the truck back—the hindmost truck.

X Q. No. 322. Will you explain what you mean by the last clause of your last answer, as fully as you can?

A. The connection was a piece of refuse board, very frequently; when applied to the timber cars, suited to the length of the timber, and the rear car was frequently drawn back by the temporary coupling piece.

X Q. No. 323. Was the object of the strip of board, or connection,

between the platform cars, when connected and used as stated by you, to prevent the cars from being separated under the load?

A. I never considered the temporary coupling as of any use myself, while the load was on the car.

X Q. No. 324. How near the ends of the timber, when transported on two platform cars, as stated by you, was the position of the bolsters on which the load rested?

A. That depended entirely on the length of the timber.

X Q. No. 325. State the distance for the several lengths.

[Question withdrawn.]

A.

X Q. No. 326. What amount of cord wood was considered a load, when it was piled upon the timbers in which it was carried, as stated by you in your direct examination, in two ranks?

A. I think they hauled about four cords of dry wood; two cords of green wood was considered a load.

X Q. No. 327. Did the superintendents of the several shops, or departments, make reports of all the work done under their direction, keep the time of the men working under them, and exhibit a return or voucher for the work and time of the workmen superintended by them? and, if yea, did you do so, and to whom was it made? or who did so for the shops in which you were engaged?

[Objected to by Defendant's Attorney.]

A. I kept the time of the hands, paid all the hands, kept an account of the cars constructed, account of repairs, and rendered a monthly report to Mr. Brown or Mr. Gillingham.

[Recess until 4 o'clock, P. M.]

X Q. No. 328. Did you, having superintendence of shops in which business of the said company was done, make full reports of the work done therein, the time in which the workmen were employed, the manner in which they were employed, and the bills for materials purchased by you, to be used in said shops? state particularly to each.

A. I did make monthly reports of the work done in said shops; I kept the time all the workmen were employed; I think I did not report the manner in which the workmen were employed; I did report the bills for materials purchased by me, for use in said shops.

X Q. No. 329. State, if those were written reports, to whom they were made, and what became of them.

A. The monthly pay-roll was a printed form; I filled it up, and carried out each man's account; I don't recollect whether the pay-roll comprised anything more than the time and pay of the men employed; there were other reports, which were written, made to the superintendent, of the number of cars made during the month, and the repairs, while I had charge of the repairs; I do not know what became of the reports, after they passed out of my hands; Mr. Woodville was the auditor, and I gave the pay-rolls into his hands; he audited the accounts, and gave me a check for the money.

X Q. No. 330. Did you make the drawing entitled Defendant's Exhibit G? if yea, from what drawing or memoranda did you make it? state fully in relation to it.

A. I made this or a similar one. I made it from memory, or a sim-



ilar drawing to what was given me when the Columbus was first commenced.

*X Q. No. 331.* Did you make the drawing marked Defendant's Exhibit I? and if yea, state what it is, and from what source or information you made it; state fully.

*A.* I made this or a similar one. I made it from memory, as representing the drawings I made on a board, when I built the Columbus.

*X Q. No. 332.* State when the said drawing, marked "Defendant's Exhibit I," was made, and also state how long since you have seen the original, of which it is a copy.

*A.* It is some three weeks from the present time, since I made it. The original I have not seen since 1831, sometime in the summer; that I made on a board.

*X Q. No. 333.* Do you state without hesitation, that it is a true and correct representation of the running gear of the car Columbus, as she was constructed when first put upon the said road, about the first of July, 1831?

*A.* I do, sir, as far as my memory serves me.

*X Q. No. 334.* Look at the paper marked Defendant's Exhibit H; state what it is, and from what source the statements contained therein have been derived; when it was made, and in whose handwriting it is, giving the persons' name and residence.

*A.* It is a statement of the names of hands that worked under me, and the time, or about the time, they came to work with me; with two items of lumber purchased for the Columbus. I derived the statements on it from an old time book I used. It was made about the time I was called upon to appear before you, the Commissioner; and it is the handwriting of C. Gatch, No. 71 Columbia st., Baltimore.

[The Plaintiff's Attorney here desired the witness to produce the book referred to, when he should return for further examination in the morning.]

Thereupon, adjourned until tomorrow morning, the twelfth day of May, 1853, at ten o'clock, A. M.

On this twelfth day of May, 1853, at ten o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney of the Defendant, and Charles D. Gould, Attorney of the Plaintiff, and the witness, Conduce Gatch, and thereupon, I proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

*X Q. No. 335.* Please produce the book you were asked to bring yesterday, and hand it to Plaintiff's Attorney.

[The witness here handed two books to the Plaintiff's Attorney.]

*X Q. No. 336.* Is there any memorandum or record, in either of said books, which enables you to fix the date at which the construction of the said car Columbus, commenced? and if yea, state what such record is.

*A.* There is nothing here that will show the precise date she was commenced; merely items of lumber, that were purchased for her construction.

*X Q. No. 337.* Was the said record made at the time such purchase was made? and if yea, is it made in pencil or with ink?

A. It was made during the month the purchase was made. It was made with pencil.

X Q. No. 338. Is there any record in either of said books, which enables you to fix the date at which the timber cars, as stated to have been constructed by you, were first used? and if yea, state what it is.

A. There is no memorandum, to my knowledge, in reference to them.

X Q. No. 339. Is there any memorandum in either of said books, which enables you to state the precise time, or month, at which the wood cars for carrying cord wood, were first constructed or used?

A. Not to my knowledge.

X Q. No. 340. Have you any other memorandum, or thing, which enables you to fix the precise time, or month, in which the said cars for carrying cord wood, were used, or how many were used, during the years 1830 and 1831? if yea, state what it is particularly.

A. I have no memorandum that states particularly, with reference to the wood cars. I have a memorandum here, for cars made for the transportation of coaches and horses, &c.,—coaches and horses it says here—done December, 1830; which was an eight-wheel car, with a gangway hung at the end, on hinges, which was lowered down, one end of it resting on the track, made of sufficient strength for a horse to walk up on, with strips across it, to keep him from slipping, up which gangway, carriages were taken up, or anything else, which could be transported on said car.

X Q. No. 341. Will you state, or read, the memorandum referred to in your last answer?

A. "Work done December, 1830, to trussells made for the transportation of coaches and horses."

X Q. No. 342. Is there any other memorandum with that? if yea, read the whole of it.

A. The first—"To two plain box wagons, for stone, No. 41-42; "to trussells made for the transportation of coaches and horses; to one baggage wagon; to one ditto plain box wagon, 43; (that is the number of the car.) To making 160 lights of sash for shop. To fitting up house for the accommodation of passengers. To making 4 plain box wagons, No. 44, 45, 46 and 47. To making new sides for coach No. 2, with brakes complete. No. 17 has new boxes and friction wheels pinned. No. 22 new boxes, and pinned axles. No. 13, old boxes, friction wheels, not pinned. No. 14 has new boxes with axles rusted in, no pin. No. 25 A, examined friction wheels fast, not pinned on, March 28th. March 31st, Baltimore new wheels and pinned friction wheels. No. 14, re-examined, found fast, put on four other boxes, no pins in friction wheel boxes off, 14 put on. No. 26, pins rusted in. No. 24, examined, fast, wheel put on, not pinned." That is all the memoranda during the month of December, 1830.

X Q. No. 343. Is there not a part of said memorandum, as read by you, which requires explanation? and if yea, make such explanation.

A. The dates, March 28th, March 31st, refer alone to the time those cars were built and placed on the road, which was the previous spring.

X Q. No. 344. By the words "previous spring," do you mean the spring of the year 1830?

A. Yes, sir.

X Q. No. 345. Is the memorandum read by you, the original from

which the statement of work, made by you, as having been done in the shops under your superintendence, for the month of December, 1830, was made out and submitted to the company? if not, state what it is, and all about it.

A. This is the original memorandum from which the monthly statement was made.

X Q. No. 346. When do you now state that more than one cord wood car, or any other than one, was constructed by you, or under your direction, for use on said road, prior to the first of April, 1831; that is to say, in which of the months of the winter of 1830-31, were cord wood cars constructed in the said shops superintended by you?

A. I do not recollect the precise month, but during the winter of 1830-1, there were a number prepared for hauling wood.

X Q. No. 347. Will you swear that there was one constructed in said shops, during the month of October, 1830?

A. No, sir, though there might have been a half a dozen.

X Q. No. 348. Have the gondola cars, which you have spoken of, as now in general use on the railroads about Baltimore, a connection from one bearing carriage to the other, or any attachment between the body of the car and the bearing carriage, other than the king bolt passing down through the body and bolsters of the body and truck or bearing carriage; and state, also, in what manner such gondola cars are drawn, whether the power is applied to the body, or the bearing carriage?

A. There is no other attachment than that which is made by the king bolt passing through the bolsters on the body and trucks. They are drawn by a connection to the body.

X Q. No. 349. Do you know of any instance which occurred in 1830, in which one of the king bolts connecting the bolsters on the timber or wood car, was broken while in use? if so, state the particulars of the accident.

A. I do not recollect of any such occurrence.

X Q. No. 350. When was cord wood first carried on four-wheel cars on said road?

A. I do not recollect. I judge, though, tolerably early in 1830.

X Q. No. 351. At what distance from the ends was the bolster placed, under the body of the car Columbus; were they not one quarter of the length of the car from each end?

A. One fifth from the end.

X Q. No. 352. By what circumstance or thing are you guided in so stating?

A. According to my judgment, considering it to be the proper place for it.

X Q. No. 353. In what position is it indicated in Plaintiff's Exhibit, No. 4.

A. If the scale is three quarters to the foot, a little upwards of five feet from the end.

X Q. No. 354. About what or at what proportion, in distance, is the centre of said bolster, from the end of said car body, in the drawing marked Plaintiff's Exhibit No. 4, as compared with the length of the body?

A. As seventeen is to seventy-two.

X Q. No. 355. About what or at what proportion, in distance, is the

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centre of said bolster from the end of said car body, in the drawing marked Plaintiff's Exhibit No. 4, as compared with the length of the body? is it not very nearly one-fourth of the length of the car from the end?

[Objected to—as answered before, precisely—by Defendant's Attorney.]

A. The distance is as sixty-seven to two hundred and eighty-eight. Something more than one-fourth from the end.

The Commissioner being called out of the city by the extreme and fatal illness of a near relation, the further taking of depositions, was, with the assent of the attorneys for both parties, adjourned to the 20th day of May, 1853, at 10 o'clock, A. M. Said adjournment being necessary and unavoidable, on the part of the Commissioner.

On this 20th day of May, 1853, at 10 o'clock, A. M., appeared before me, William W. Hubbell, Esquire, Attorney for the Defendant, and Charles D. Gould, Esquire, Attorney for the Plaintiff, and the witness, Conduce Gatch, and thereupon, I further proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

X Q. No. 356. In planning the car Columbus, what object or purpose had you in view in making the car body octagonal?

A. Well, it appeared to be the cheapest and simplest mode of preparing the doorways. Taking off the corners left a small platform to step on.

X Q. No. 357. Will you look at the paper now shown you, and state what it is?

A. This is a monthly pay-roll, comprising the number of days and wages of hands, bills annexed and their vouchers, with original signatures filled up in my handwriting, audited by Mr. Woodville.

X Q. No. 358. In what branch of what department, and under whose superintendence is the said pay-roll a record?

A. It is a record of the expenditures of the car building under the superintendence of Mr. George Brown, for the Baltimore and Ohio Railroad Company, for the month of November, 1830.

X Q. No. 359. By whom was the said pay-roll made up and submitted?

A. By myself.

X Q. No. 360. Will you state what is the meaning of the indorsement on the back of said pay-roll? please read the same to the Commissioner?

A. I do not know exactly which you have reference to.

X Q. No. 361. All of it.

A. A portion of it is a list of work done in November, 1830; it reads as follows:—

“A list of work done in November, 1830.

To making two new plain box wagons, for Hincks, for stone, Nos. 36 and 37.

New sides and brakes to Constellation.

Making one new coal car on Winans's plan.

Ditto. one do. plain box wagon, for Hincks, No. 38.

Altering one old wagon.

Ditto. and fitting up with sash doors and springs, Col. Long's wagon.



Making two new wagons for scrap iron, &c., Winans's plan.

There are two lines here which are marked out; they are as follows:—

Fitting up one old frame for low wheels.

Making two new plain wagons, Nos. 39 and 40—this line is not marked out—the next one, which is as follows, is: Fitting up one old frame for low wheels—that is marked out.

Making seven pair new shafts, and repairing twenty old ditto—some both shafts, others with one.

Smith's work for the above shafts and wagons."

The balance is the marks of the clerk, designating the quarter in the year, the amount of money, &c.; it reads as follows:—

"Voucher, No. 32, Abstract A. C. Gatch, \$429.84. Fourth quarter, 1830."

*X Q. No. 362.* Describe the manner in which the two lines on such list of work, as read and stated by you, are marked out.

*A.* Marked across by a pencil.

*X Q. No. 363.* Does such marking across by pencil, in the least degree, prevent the lines from being read and fully understood?

*A.* No, sir.

*X Q. No. 364.* Will you look at the paper now shown you, and state what it is, describing fully?

*A.* This is pay-roll for December, 1830, the same as above.

*X Q. No. 365.* Will you turn the said pay-roll over, and read the indorsement on the back of it, stating what it is?

*A.* "Statement of work done December, 1830;" it reads as follows: "Work done December, 1830.

Two plain box wagons, Nos. 41 and 42.

Two trussels for the transportation of horses and carriages.

One baggage wagon.

One plain box wagon, No. 43.

Fitting up Col. Long's wagon with springs, glass, &c.

Making one hundred and sixty lights of sash for shop.

Four plain box wagons, Nos. 44, 45, 46, 47.

Making new sides for coach with breaks, complete.

One new pair of shafts, thirteen pair repaired.

Smith work for the above.

Painting."

Marked on the back as follows:

"Voucher No. 58; Abstract A; C. Gatch; \$416.80; 4th quarter, 1830."

*X Q. No. 366.* Are the indorsements on the said pay-rolls, which you have read, the returns made by you to said company for the work done under your superintendence?

*A.* The one, or abstract A, for the month of December, 1830, is in my handwriting. The one for November is not in my handwriting; but both, I suppose, are reports from me.

*X Q. No. 367.* Will you look at the document or paper now handed you, and state what it is, describing it fully?

[The paper objected to by Defendant's Attorney, at this time and in this order.]

*A.* This appears to be also a pay-roll, for March, 31, 1831, similar to the two preceding ones; it is for the month ending March 31st.

X Q. No. 368. Will you read the indorsement on the back of it, stating what it is?

A. Amount of work done throughout March, 1831. It reads as follows:

"Amount work done throughout March, 1831.

March.

- 2 Winans waggons, for flour, No. 23 and 24.
- 4 Common box waggons.
- 12th, 2 Winans waggons, for flour, No. 25 and 26.
- 1 Common box waggon.
- 19th, 2 Ditto ditto.
- 1 Winans waggon, No. 27.
- Running gears, for 2 Winans' cars, for Orleans, No. 28 and 29.
- 26th, Ditto, ditto, 2 ditto waggons, for stone.
- Ditto, ditto, 3 ditto, ditto, ditto.
- Ditto, ditto, 1 ditto, ditto, ditto.

Marked on the back, Voucher, No. 39, Abstract B, C. Gatch, \$549,16. 1st quarter, 1831."

X Q. No. 369. Is that the return of work done by you, for the month of March, 1831, in the shops under your superintendence?

A. I judge it is the report of the principal part of what was turned out during the month for use on the road.

X Q. No. 370. Will you look at the paper now shown to you, and state what it is, describing it particularly?

A. This is also a monthly pay roll, for January, 1831, similar to the other three examined by me, with the following as a list of work done in said month.

"A list of work done at the depot on Pratt Street, throughout January, 1831:

- To new sides on coach Baltimore.
- Ditto do. do. do. Constitution.
- 2 New Winans cars for coal, &c.
- New sides on Maryland.
- 2 New Winans cars for coal, &c.
- New sides on horse car.
- 1 New snow car, and repairing.
- 3 New common cars, for stone and iron.
- 1 Do. Winans wagon.
- Smith work.
- 2 plain box wagons.
- Painting, &c.

"Signed"

CONDUCE GATCH, M.C."

Marked, "Voucher, No. 3; Abstract B; C. Gatch, \$479,40; first quarter, 1831."

X Q. No. 371. Will you look at the paper now shown you, and state what it is, describing it fully?

A. This [?] also a pay-roll, for the month of February, 1831, with the following report of work done in that month.

"Amount of work done, February, 1831, at the Baltimore and O. R. R. Company's shops:

- 5th, 1 New Winans wagon, for coal.
- 11th, New sides on Ohio coach.

12th, 4 New Winans wagons, for coal and flour.

15th, 1 New Winans wagon, for ditto.

28th, New sides on Chesapeake coach.

Coach-making, smithing, &c.

"Signed"

CONDUCE GATCH, M. C."

Marked on the back as follows: — "Voucher, No. 31; Abstract B; C. Gatch, \$472.76; 1st quarter, 1831."

X Q. No. 372. Are these two last, the reports made by you to the said company of the work done in the shops under your superintendence?

A. I judge they are, of work finished and turned out of the shops.

[Recess until four o'clock, P. M.]

X Q. No. 373. Will you look at the document now handed you, and state what it is?

[Objected to by Defendant's Attorney.]

A. "The Fourth Annual Report of the President and Directors to the Stockholders of the Baltimore and Ohio Railroad Company."

X Q. No. 374. When does the said report purport to have been printed?

[Objected to by Defendant's Attorney.]

A. In the year 1830.

The counsel for the Plaintiff handed to the witness, previous to putting the two last preceding questions, the document which is herewith returned, marked "Plaintiff's Exhibit No. 5," and desired the Commissioner to file the same with the deposition.

X Q. No. 375. Will you turn to page 4, of said document, marked Plaintiff's Exhibit No. 5, and read the first paragraph on that page, commencing at "the first division of the road," &c.

A. No, sir.

[The Defendant's Attorney objects to the Attorney for the Plaintiff asking the witness to read from the document, marked Plaintiff's Exhibit No. 5; 1st, on the ground that it is not evidence of itself; 2d, it has not been properly made evidence; 3d, it does not purport to be a report made by the witness; 4th, it shows on its face what it states without being read by the witness; and 5th, the counsel for the Plaintiff himself stated to the witness and Commissioner this morning, that he had closed the cross-examination, and the recess, until this afternoon, was understood to have been for the purpose of reading the cross-examination to the witness, for his correction, if necessary; and 6th, that the cross-examination has already been prolonged to an unwarrantable extent.]

Thereupon adjourned until to-morrow morning, the 21st of May, 1853, at 10 o'clock, A.M.

On this 21st day of May, 1853, at 10 o'clock, A.M., William W. Hubbell, Esquire, Charles D. Gould, Esquire, and the witness, Conduce Gatch, appeared before me, the Commissioner, and thereupon I further proceeded to take the deposition of the said Conduce Gatch, as follows, to wit:—

X Q. No. 376. Were four-wheel cars in use on said road, arranged and adapted for carrying cord wood on said road? if yea, state when, as

near as you can, and also particularly in what manner they were so arranged and adapted.

A. There were cars arranged and adapted for carrying cord wood, in the fall and winter of 1830-31. The manner of construction was placing a bolster on each of the trucks, notching down two longitudinal pieces of scantling some six or eight inches square, some four feet apart from out to out, with standards at a suitable distance to carry a sufficient load.

X Q. No. 377. Were four-wheel cars in use on said road arranged and adapted for carrying cord wood, singly, and not in pairs? if yea, state when, as near as you can, they were first so arranged, and the manner of the arrangement and adaptation.

A. There were no four-wheel cars, to my knowledge, built expressly for carrying cord wood, or particularly adapted for that purpose. I don't think there was one built expressly for that purpose.

X Q. No. 378. My inquiry was not as to the building of cars for that purpose, but with reference to arranging and adapting those in use for that purpose, as four-wheel cars, to be used singly.

A. There were a number of cars used singly for that purpose; but no change in the construction of the car, and no alteration, but by placing rough standards in the box cars, which was done by those that used them, generally.

X Q. No. 379. What was the quantity of wood which the wood car you have heretofore spoken of, having two four-wheel cars and timbers, carried as a full load in 1830 and 1831?

A. Two cords of green wood was, I think, considered a load for eight wheels, and from three to four cords of dry wood.

X Q. No. 380. Will you look at page six, of the document marked "Plaintiff's Exhibit No. 5," and state whether you do not find the following paragraph on that page:—

"In recurring to the circumstances under which this work was commenced, and considering the many difficulties which attended its early progress, the Board are convinced that no enterprise, either in our own country, or abroad, labouring under similar embarrassments, has ever been carried forward with more rapid progress, or more triumphant success; every anticipation of the advocates of the undertaking has been fully realized—an incontestible proof has been afforded of the superior advantages of the system, as a means of intercommunication, over all others that human ingenuity has devised."

Please state particularly.

[Objected to by Defendant's Attorney, as the Plaintiff's counsel formally closed the examination yesterday, and a recess was taken till the afternoon to read the witness' cross examination, and also as the book shows for itself what is on its face.]

The Defendant's Attorney here gave notice to the Commissioner, as follows, viz:—

ROSS WINANS v. THE EASTERN RAILROAD COMPANY.

*Circuit Court of the United States for the District of Massachusetts.*

To Levin Gale, Esq., U. S. Commissioner :

In consequence of the unusual length, and unnecessary matter reduced



to writing, and introduced in the cross examination of my witnesses, at the instance of the Plaintiff's Attorney, my duty to my client, the Defendant, compels me to notify you, and I do accordingly notify you, that I cannot pay for any further cross-examination of Conduce Gatch, reduced to writing by you ; and must ask you to look to the Plaintiff, or his Attorney, for your compensation for reducing to writing the further cross-examination of said Gatch, and such other witnesses as I may examine on behalf of the Defendant.

The Plaintiff is reported here to be worth at least two hundred thousand dollars, and I presume is able to pay your fees for his lengthy cross-examinations.

Yours, &c.,

WM. W. HUBBELL, Attorney for Defendant.

Baltimore, May 21st, 1853.

Which notice was thereupon communicated to the Plaintiff's Attorney.

A. That is correct, as it is here found in this book. I mean the quoting of it is correct.

X Q. No. 331. Will you turn to page 8, of the same document, and state whether or not the following paragraph does not occur on said page :—

“ There could not be found, amongst the stockholders, one individual who had experience in the construction of railroads ; few of them had ever even seen one. A board of directors was, therefore, to be selected, who, from necessity, had to acquire all the practical knowledge essential to the proper government and direction of the operations of the company. As a first step of this Board, inquiry was made for engineers, acquainted with the principles and construction of railroads ; but none could be found who possessed more than a very imperfect theoretical knowledge upon the subject. Some experimental railroads, in our own country, of small extent, and of rude and imperfect construction, were examined by a committee of the Board, but these disclosed no important information, further than as they afforded additional confidence in the principles which had led to the adoption of the plan of our railroad. All information necessary was, therefore, still to be acquired by the Board and agents of the company, before they could venture to advance a single step in the work.”

State particularly.

[Objected to by Defendant's Attorney.]

A. That is correctly quoted, I believe.

X Q. No. 382. Will you turn to page four of the same document, and state whether you do not find the following language :—

“ The first division of the road was opened, for the transportation of passengers, on the 22d of May, 1830, being a little more than eighteen months after the commencement of the work upon it, but the preparation of the necessary cars was not effected until the early part of June, following, from which time the travelling upon this division, including a distance of about thirteen miles, has been constant and uninterrupted ; and, on the first of October, there had been received twenty thousand and twelve dollars and thirty-six cents, although but a single track was completed, and the company were not in a situation, until within a short time past, to undertake the transportation of any merchandise or produce, and are still unable to convey one-tenth part of the quantity that is offered.”

State fully.

A. That is correctly quoted.

X Q. No. 383. Will you turn to page twelve, of the same document, and state whether the following language is not used there :—

“ During the time we have been engaged in this work, many important improvements have been made, both in the construction of railroads, and in the application of moving power upon them, by which an immense reduction in the cost of transportation, and increase of velocity have been effected. Among these improvements may be noticed the facilities which the combined cylindrical and conical wheels, invented by the chief engineer of this company, afford in turning curves. By the aid of this highly valuable improvement, all doubt is removed of our being able to employ locomotive steam-engines upon the Baltimore and Ohio Railroad. This discovery is the more important to us, inasmuch as from the surface of the country over which our route must be conducted, numerous curves in the track will be unavoidable, and the great advantage of this form of wheels consists in their so readily accommodating themselves to the degree of curvature upon the road, that there scarcely appears to be any perceptible obstacle to the passage of the cars over these curves more than upon a straight line. Improvements have also been made in the construction of the turn outs, and in various other minor fixtures, both on our road and cars.”

And if yea, is not the report, of which the above are extracts, thus closed : “Signed by direction, and on behalf of the board,

PHILIP E. THOMAS, President.

Baltimore, October 11, 1830.”

State particularly.

[Objected to by Defendant's Attorney.]

A. The quotation is correct. This important improvement here attributed to Mr. Knight, the chief engineer, turned out to be the improvement of a Mr. Wright, which was proven by a suit to be the invention of Mr. Wright; and all the vibratory motion of axles was stopped upon the Baltimore and Ohio Railroad upon the conclusion of the suit.

X Q. No. 384. Will you turn to page nineteen, of the same document, and state whether you do not find there, as part of the report of Jonathan Knight, the chief engineer of said company for the same year, the following language :—

“ It having been found necessary to case-harden the rims of the cast iron wheels, intended to run on railways, by casting them in iron chills, it will be indispensable to extend the chill over the conical as well as the cylindrical part, in order that that part may be as durable as the other. This has been done upon all the new wheels now in use on our road. Experience, however, has pointed to the use of some modification in the disposition of the volume of the metal composing the rim (the form of the face remaining the same), and also, in the form of the chill, so as to attain the greatest perfection which shall be practicable. This subject is now under deliberation, and, I have no doubt that, with the aid of John Elgar, my assistant, and of Ross Winans, the inventor of the friction-car, assisted by the skilful mechanics of Baltimore, that, not only this matter, but others of equal utility towards perfecting the moving parts, will be attained. The latter named person is now engaged in perfecting the practical application of his valuable invention.”

State particularly.

[Objected to by Defendant's Attorney.]

A. The quotation is correct, I believe. I will now give you the ori-

gin of this important improvement, and where it sprung from. Previous to my being engaged with the Baltimore and Ohio Railroad, while attending to my profession as a mill-wright and carrying on that business, I had considerable experience in the application of chilled metal to steps for upright shafts, &c. About the time I commenced working for the railroad company, I had to repair a step gudgeon that had been at work in the City Mill in Baltimore, which previous to this time had been very troublesome and dangerous. I took the exact size of the gudgeon, formerly made of steel and iron; made a pattern myself; Mr. George Gillingham made a chill, by my directions. I had a cast iron toe cast and chilled, and put it to work instead of the former, which remedied the former evil completely. The next movement towards chilling iron was made on a car built at Mr. Gillingham's shop, for which I made the patterns. Mr. Elgar, I think, made the chills. That is the origin of chilled metal for railroad purposes. I would like furthermore to state, that I made the first gauge that ever was made to turn a chill by for a railroad car.

X Q. No. 385. Will you give the dates at which these various occurrences, detailed in your last reply, occurred, as near as you can?

[Objected to by Defendant's Attorney.]

A. In 1829, the latter part, and early part of 1830, was the chilling of the boxes for the car; in the latter part of 1829, the chilling of the step.

X Q. No. 386. Will you now turn to page 22 of the said document, and state whether the following language is not used there?

"Attention will continue to be devoted to the highly interesting, if not all important subject of the machinery connected with the motive power, until the utmost perfection practicable shall have been attained. It may be that the lessening of friction cannot advantageously and permanently be carried much, if any, beyond its present term; and that the greatest improvements which are yet to be made, will consist in giving due proportions, and proper degrees of strength and hardness, to the parts subject to breakage and wear."

"The preservation of the cars, and of the road, will be materially promoted by the use of springs, in all cases, and especially if the motion be rapid."

"It may here be remarked, that the two kind of cars (herein before alluded to,) having been constructed, the intention is, that each kind shall be perfected to the highest degree which its plan will admit of, in order that a fair comparison between them can be made, as to cost, permanency, and useful effect, having regard to the particular branch of transportation in which they shall be employed respectively."

"For further information in relation to the machinery, I refer to the report of John Elgar, Assistant, marked No. 3."

State fully.

[Objected to by Defendant's Attorney.]

A. The quotation is correct.

Thereupon (as to-morrow will be Sunday,) adjourned until Monday morning, 23d May, 1853, at 10 o'clock, A. M.

On this 23d day of May, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esq., Attorney for the Defendant, and Charles D. Gould, Esq., Attorney for the Plaintiff, and

the witness, Conduce Gatch; and, thereupon, I further proceeded with the deposition of the said Conduce Gatch, as follows, to-wit:

X Q. No. 387. Will you now turn to page 34 of the document marked Plaintiff's Exhibit No. 5, and state whether you do not find the following language?

"Within the last few months, the improvements in locomotive steam engines have been such as to ensure their general use on all railways of suitable graduation, and where fuel is cheap. The weight of these machines have [?] been so greatly reduced, and the generation and application of the power so much economized, as to put to rest all comparison between locomotive and stationary power on the Liverpool and Manchester Railway. From the experiments in October last, on that road, with the improved locomotives, as well as from other trials subsequently made, it has been demonstrated that these machines are capable of maintaining any desirable velocity which the bounds of prudence may warrant; and that such is their celerity and economy of movement, that the facilities of travelling and conveyance upon railways will far transcend those of any other method hitherto known."

"With locomotives, the transportation of commodities may proceed with the same velocity as the conveyance of persons, with very little, if any, increased expense. This arrangement will add immensely to the capacity of the road, while it will greatly lessen the number of engines, wagons, and men, necessary to be employed. The movement may be from ten to fifteen miles per hour, so as to average ten miles, including all stoppages."

"I am aware that this velocity is not so great as many persons may desire, or as might be attained under very favorable circumstances; and possibly it may yet be transcended, as much as ten miles per hour exceeds the comparatively slow rate of travelling on our turnpike roads, at present. Yet, there are causes, to be found in the necessary frailty of the machines, and of the railway, inseparable from the physical nature of their parts, in the importance of safety to persons, *and in the extent of the actual wants of the community*, well calculated to set bounds to theoretic ideas, unchastened by a knowledge of practical mechanics."

State fully; and is not the said document signed "J. Knight, Chief Engineer"?

[Objected to by Defendant's Attorney.]

A. The quotation is correct, and signed J. Knight, Chief Engineer.

X Q. No. 388. Will you now turn to page 68 of the same document, and state whether you do not find there the following report of John Elgar, heretofore referred to in the quotations herein before inserted?

"[No. 3.]

"BALTIMORE, Sept. 27, 1830.

"To J. Knight, Chief Engineer Baltimore and Ohio Railroad:

"Having been appointed, in the early part of last spring, assistant engineer of machinery, it became my duty to procure the necessary patterns, castings, and smith work, for the company, and to superintend the constructions of the cars. On entering upon the discharge of these duties, the various details confided to my care were attended to; and, amongst others, an iron pattern for casting the cone and cylindrical wheel, and the necessary chills, were procured. Contracts were also entered into for the other requisite castings and smith work of the cars."

"In April contracts were also made, and the necessary patterns furnished for casting 32,000 knees for the stone block ways. This contract was fulfilled. The patterns, castings, and switches, for twenty-three turn-outs, were also procured during this month; and, to my other duties, was added that of laying down these



turnouts on the first division of the road, thirteen of which were finished, and the road opened for travel, on the 22d of May."

"In the meantime, the running gear for six friction wheel cars, were completed, and furnished to a contractor, to be mounted with coach bodies, the first of which, the Pioneer, was put on the road, and on the twenty-second of May, led off the first train to Ellicott's Mills."

"The construction of the new burden cars, was now commenced, on the plan which had been introduced in the fall, of outside steel pointed journals, revolving in chilled cast iron boxes; 30 of this kind, and six with friction wheels, have been completed, and put to constant use, in transporting stone sills, and other materials for the second track, or employed in conveying freight to and from Ellicott's Mills. Five passenger cars with chilled boxes, and four with friction wheels, have also been constructed at the depot, which with eight coaches, lately furnished, by contract, and three that were in use last year, make the complement of thirty-six burden, and twenty passenger cars, now in active use."

"It is thought that some improvement in the wheel pattern is necessary, to give full effect to the operation of the *chill*, in communicating the hardening principle, though a number of the wheels have run from four to five thousand miles, without much perceptible wear."

"A car has been constructed with the side pieces of the frame which rest on the bearings so long and slender, as to be elastic, and yet of sufficient strength, to bear a load of two tons. The result of this experiment has shown the importance of having springs immediately at the journals, or bearings of a burden car of rapid motion, as well as to passenger cars. The concussion of the wheels upon the inequalities of the rail, is diminished considerably by it, the plan is cheap and simple, and it is believed, might be used with advantage, until steel springs may be adopted."

"An improvement has also been made in the turnout, which combines several advantages over those heretofore used. On this plan, only one switch is required, which makes it unnecessary to have any projection below the surface of the road, to be obstructed by ice or other matters. The switch cannot be injured by the operation of the car wheel opening or closing it—nor can the car be injured from a neglect to move the switch by hand; either can only be disordered, by the too rapid motion of the car, when entering the turnout. The car moves through, at a slow motion, without much resistance, and is subject to very little strain, and consequent wear.

Respectfully,

J. ELGAR.

*Assistant Engineer of Machinery."*

[Objected to by Defendant's Attorney.]

A. That is correctly quoted.

X Q. No. 389. Will you now turn to page sixty, of the report of the Directors of the Baltimore and Ohio Railroad Company, to the legislature of Maryland, in 1831, and state whether you do not find there, and on the following pages, a document entitled, "Reports A—Engineers' Office, Baltimore and Ohio Railroad Company, January 25, 1831;" addressed "Philip E. Thomas, President, &c."; and is not the said document signed "J. Knight, chief engineer." And if yea, is there not on the third page of the said document, the following language used?

"The construction of cars and burden wagons, has also been carried on to the extent, which the short length of railways completed, required, but no further; for it being foreseen that improvements would, and would very soon be made, in the construction and arrangement of their parts, it was thought that a prudent economy

dictated the construction of the least number that the necessities of the present time required."

"By reference to the last annual report, it will be seen that improvements were then anticipated, and they have been attained, to a considerable extent."

"It is hoped that in the next annual report, we shall be able to exhibit the relative friction of the two kinds of cars which we have been endeavoring to perfect. One of these is a plain car, with outside bearings, which is preferable to the English car, the bearings of which are inside of the wheels. As the outside bearing is at the point of the axle, exterior of the wheel, it can therefore be oiled with the greater facility and cheapness. The axle, at the bearing, may also be smaller, and it can be conveniently steeled; at the same time, the box can be made more perfect. The experiments made have been very favorable to this mode of arrangement."

"The Winans car has also received essential improvements, within the last few months; not however, in its principles, but in the form and consistency of its wearing parts. The inventor has succeeded in hardening the friction wheel and the axle, so as to ensure the success of his principle; the rubbing parts have also been enclosed so as to prevent the access of dust, while at the same time, the oiling is accomplished without difficulty or delay, and the consumption of oil is reduced to an amount exceedingly small."

"According to trials which have been made, the friction is now reduced to the one four hundredth of the weight, being the one half of the best English railroad car."

"The wheels which will roll upon the rails, are alike for each kind of car; these have also been improved, as stated in the annual report, and some modification has since been made in the pattern, by which they will be strengthened. These wheels are believed to be the best that have been made, for railways."

"We may therefore consider it certain, that in connection with the improved locomotive engine, the efficiency of railways is now double if not treble, what it was when the Baltimore and Ohio Railroad was commenced. It is possible, if not probable, that further improvements, both in the construction of railways, and in the application of motive power upon them, are yet in store. Nevertheless, the present state of these improvements, is alone, sufficient to place railways, in point of speed, certainty, and general advantage, preeminently above any other description of interior communication yet known."

Respectfully submitted,

J. KNIGHT, *Chief Engineer.*"

[The Defendant's Attorney objects to the question.]

The Plaintiff's Attorney here handed to the witness the book quoted from.

The Defendant's Attorney objects to the book handed to the witness, and requires that it be filed as an Exhibit, and returned to the Court, that it may show on its face, for itself, what it is, and what it states; and also objects that it is not evidence of the facts stated in it as such.]

A. I do. That is a correct quotation.

X Q. No. 390. Will you turn to page 20, of the fifth annual report of the President and Directors of said Baltimore and Ohio Railroad Company, dated October 1st, 1831, and state whether you do not find there, as part of the report from the "engineers' office," to the President of said road, the following language?

"The cylindrical and conical form of the face of the wheel remains as at the first, excepting that the rise of the conical part has been changed from a ratio of 1 to 6, to that of 1 to 5; whilst the breadth of this part, which was one inch, has

been increased 3-16 of an inch. The rise next to the flange is, therefore, now 1-4 of an inch, instead of 1-6, as formerly."

"This change was induced from a conviction that the motion of the cars would, in general, be rendered steadier, and with considerable velocities easier in the extreme curvatures. It was also believed that the effects of chilling would be greater, whilst the cone would be more durable; at the same time, the experimenton friction justified the conclusion that no lateral thrust would result from this increase."

"Experience so far appears to confirm all these expectations; and it is believed that a decided improvement has thus been effected."

And, if yea, are not the following extracts on the same and following page?

"It is evident that the durability of the road, and of the cars, and especially of the wheels, would be promoted by the use of springs interposed between the load and the running gear. This precaution would also increase the efficiency of the moving power."

"From unavoidable deviations of the plane of the surface of the rails, from that of the bearings of the car, the pressure of the weight frequently becomes transferred to three, and even to only two, of the four wheels; and this transfer of pressure, and consequent concussion, is continually varying upon the wheels diagonally across the carriage."

"The employment of springs would, however, not only greatly tend to equalize the pressure under these varying circumstances, upon all the wheels, but would likewise greatly lessen the concussion and its effects."

"It has been found absolutely necessary to the comfort of passengers, that carriages used for their conveyance should be mounted upon springs, or upon some equivalent elastic fixture. Now, the jars and concussions that would destroy the comfort of the passenger, become increased with a load of stone, minerals, or agricultural products, or with any other loading having a less elasticity than persons; and, although the articles of traffic may not be damaged, yet the effects upon the carriage and road will be injurious. The chief disadvantage to be apprehended from springs, is their cost; but, should this be more than returned, in the increased durability of the cars, the investment would be profitable."

"It was mentioned, in the last report, that two kinds of cars were used upon this road, and that it was intended each should receive its utmost improvement. This subject has continued to claim attention, and will be pursued until a fair comparison can be made of the relative merits of each."

"In order to test the practicability of turning of the corners of streets, in the improved parts of the city, with a track of railway, experiments have likewise been made, to ascertain the facility of turning a right angle in a given space, by means of the flanges of two of the wheels rolling upon the longer rail, the curved part of the track being one fourth part of the circumference of the circle."

"In making these experiments, as well as in the arrangement of the machinery, I have been aided by my assistants, John Elgar and Ross Winans. The latter gentleman is now engaged in planning the machinery and fixtures for the inclined planes."

"Recently a chilled box car has been constructed in such a manner as to permit the axles to vibrate. This arrangement is quite simple, and is effected by permitting the box to move backward and forward, through a small arc. In this way, the motion of the wheels is more free, and the axles may conform more to the direction of the radius of curvature of the road, giving greater effect to the cone, so that the resistance in curvatures and in passing through turn outs, will be much reduced. This car works well, and the method bids fair to be a valuable improvement. Full effect should be given to this plan, and it should be ascertained whether both ends of the axle should be allowed to vibrate, or only one of them."



"Although this modification of the chill box car with outside bearings, may ultimately enhance its value, and bring it more nearly into competition with the Winans car, as respects the amount of traction required, yet further experience is necessary before their relative merits, in all respects, and under all circumstances, can be ascertained."

"It is, however, gratifying to know, that whilst our endeavor still to improve them implies some degree of imperfection, the present state of either of these cars is in advance of that which would be necessary to insure the success of railways."

"For the report of John Elgar, assistant of machinery, see paper marked G, annexed."

State fully.

[The Defendant's Attorney objects to the question.

The Plaintiff's Attorney here again handed to the witness the book which he handed to him on asking the last preceding question.

The Defendant's Attorney objects to the book handed to the witness, and requires that it be filed as an Exhibit, and returned to the Court, that it may show on its face, for itself, what it is, and what it states; and also objects that it is not evidence of the facts stated in it, as such; and also objects to the book, as the extracts referred to, or most of them, have been marked to designate them by Plaintiff's Attorney, to the omission of intermediate paragraphs contained on the pages.]

A. The extracts are correctly quoted.

X Q. No. 391. Do the paragraphs omitted, in any wise affect the meaning or sense or impression of those which are above quoted? if yea, state in what manner, particularly.

[Objected to by Defendant's Attorney, as that is a matter for the Court and Jury to determine, after seeing and hearing the extracts read, and hearing the arguments of counsel on both sides, and not a matter for the witness.]

A. I would rather not answer that question; just a cursory look over it, I cannot tell; there is so much of it.

Thereupon adjourned until to-morrow morning, the 24th day of May, 1853, at 10 o'clock, A. M.

On this 24th day of May, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney of the Defendant; Charles D. Gould, Esquire, Attorney of the Plaintiff; and the witness, Conduce Gatch; and, thereupon, I further proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

X Q. No. 392. Will you look at page 100, of the same printed document, being the reports of the officers of said company to its stockholders, for the year 1831, and state whether you do not find there the report of John Elgar, which is referred to in the last quotation above extracted and herein copied? and if yea, is it not in the following words?

"G.

"Engineers' Office, B. & O. R. R., Sept. 30, 1831."

"To J. Knight, Chief Engineer."

"The construction of the machinery connected with the moving power upon the railway, committed to my charge, has been carried to the extent required, and consistently with its faithful and advantageous execution; and various improvements have been made in the forms and proportions, as well as in the texture of the parts liable to breaking or wearing."



"The improved turnout which was adopted last year, and adverted to in my last annual communication, has been found to answer the end for which it was designed. This improvement was effected by employing only one switch instead of two, as previously used; and by placing this one in the interior rail of the turnout, which, when thrown open to a certain limited extent, formed a groove through the rail of the direct track; through this groove the flange of the wheel is directed, by the switch, whilst the change in direction of the motion of the carriage is also aided by means of the flange of the opposite wheel rolling upon a *hard* cast-iron plate."

"During the last year, the castings and switches of these turnouts have been modified in their dimensions, so as to permit of the same width of track at the turnouts, as in other parts of the railway, to wit, four feet nine and a quarter inches, and so that the play of one and three-quarter inches for the flanges would be uniform throughout the road. This required the castings and switches to be increased in length to five feet, and is found to be an improvement; the cars passing through these turnouts with facility, and without danger from accidents."

"Such modifications, also, in the wheels and axles, as experience indicated to be necessary, have been attended to, according to instructions, and these parts have been increased in weight and durability."

"Many experiments have been made, with regard to the chilling of wheels, several of which resulted favorably; and good wheels are now made. An attempt has been made to ascertain the practicability of increasing the strength of the wheel, without adding to its weight, by casting it with an interior flange, attached to the rim on the side opposite to the exterior flange. This experiment promises success."

"The diameter of the journal of the axle, which revolves in the chill box, is two inches; and, from the circumstance, that no appearances of failure have been observed, after twelve months' use, it is believed that a diameter of one and three quarter inches may be employed to advantage. The chill cast-iron box, and the steel journal work well together, and are very durable; and no apprehension is entertained from a want of strength, or of rubbing surface, in case of the reduction in size, as proposed. Various experiments having shown the decided advantage possessed in the friction-wheel car, over the present chilled box car, in passing through the curves of the railway, in consequence of the vibration of the axles of the former permitting a more full effect to the action of the cone, an attempt has been made to extend that principle to the latter. A car has, accordingly, been fitted up in such a manner as to admit the box to move through short distances, as the axles should vary from their parallelism. This car moves through the curves with much increased facility, but sufficient experiments have not been made to ascertain, with precision, its relative merits."

"The turnout and curved way at Ellicott's Mills directed to be laid down with a radius of sixty feet, intended to be traversed by the action of the wheel rolling on its flange, has just been completed, and experiments with two loaded carriages have been made to ascertain the traction required in this curve. The result is that the traction was the 1-49 with the Winans car, and 1-45 with the chilled box car."

"It may be remarked that the near approach to equality of force required for each of the two carriages in this experiment arises from the resistance in either car being principally at the flanges of the wheels, the curvature being too great to be accommodated by the extent of vibration allowed in the axles of the friction wheel car. In passing a curve of sixty feet radius under these circumstances the advantage of the Winans car over the chilled box car, in lessening the resistance of the journals, is therefore diminished by as much as the resistance is augmented at the flanges.

Respectfully,

J. ELGAR, *Ass't Eng'r Mach'y.*

State fully and particularly.

[The Plaintiff's Attorney here hands to the witness the same afore-

said book—to which the Defendant's Attorney repeats his aforesaid objections to the same, and also that the matters therein stated are not proved to be within the legal knowledge of the alleged reporters.]

A. That is a correct quotation of what is here printed.

X Q. No. 393. Will you now turn to the 47th page of the "Sixth Annual Report of the President and Directors to the Stockholders of the Baltimore and Ohio Railroad Company, 1832, printed at Baltimore, by William Woody: No. 6, S. Calvert Street, 1832," and state whether you do not find there the following language, as part of the "Third Annual Report of the Chief Engineer of the Baltimore and Ohio Railroad," dated "Baltimore, October 31, 1832," to wit:—

*"The Machinery and Moving Power."*

"This branch of the service has been conducted with the anticipated success, so far as it has been extended, and, as relates to the construction of cars, considerably economized. For a detailed account of the operations in that department, I refer to the report of George Gillingham, Superintendent of Machinery."

"No very essential modifications of the two principal kinds of cars used, and which have been heretofore fully described, have been made since the last report; the experiment, however, then recommended, of employing springs in the burden cars, to obviate the effects of concussion is now in the course of trial, and we have high expectations of its success and benefit in lessening the wear both of the cars and the rails. With springs a greater load may be drawn, and at an increased velocity, without adding to the wear and tear. It is believed the same cars, with springs, would be as competent to bear three tons as two and a-half tons without springs, and that the damage to the railway would be less; indeed, it is probable that a locomotive carriage, of four and a-half tons, without springs, would be as injurious upon the railway as one of six tons weight, having springs, and that the difference would be at least, thirty per cent. in favour of the latter."

And also, on page 55, of the same report of the said chief engineer, Jonathan Knight, the following paragraph:

"In my plans and operations, with respect to the machinery, and in addition to the aid of the superintendent of machinery, I have been assisted by Ross Winans and John Elgar, the latter of whom has not been in the service of this company since the first of July last."

State fully and particularly.

[The Plaintiff's Attorney here hands the witness another book, similar to the former—to which the Defendant's Attorney repeats his aforesaid objections as made to the former book, and also objects that the matters therein stated are not proved to be within the legal knowledge of the alleged reporters.]

A. That is also a correct extract of what is printed here.

X Q. No. 394. Do you not find on page 108 of the same document the report of George Gillingham, superintendent of machinery of said road, above referred to, in the following words and figures, to wit:—

"Office of the Superintendent of Machinery, Sept. 29th, 1832. To Philip E. Thomas, President of the Baltimore and Ohio Railroad Company.

"In obedience to the rules and regulations for the government of the officers and agents of the Baltimore and Ohio Railroad Company, I now submit the following report of the department committed to my superintendence:

"Soon after the travelling cars, of the construction then generally in use, had been

placed upon this road, important defects were discovered in their running gears. The steeled axles of the friction-wheeled cars were found to wear so rapidly away, and to involve so heavy an expense, from the necessity of frequent repairs, that it became indispensable, in order to obviate this inconvenience, that some means should be devised to effect an improvement in the construction of them. It was conceived that an advantage might be gained by making the journals of the axles of case-hardened iron, instead of steel. The experiment was made, and it has fully succeeded.

"It having also been found that the use of friction-wheels, in burden cars, was attended with a heavy expense for repairs, a plain chilled box has, in many instances, been substituted, by which an important saving is effected. So inconsiderable has the friction been found to be on these boxes, that after the cars have been running twelve, eighteen, or more months, they are scarcely brought down to a smooth, uniform bearing, showing, indeed, very little appearance of attrition.

"Some improvement in the mode that had been used to keep the boxes properly oiled, was also found to be a very desirable object to effect; this has been attended with considerable difficulty. Several experiments were tried, the result of which was but partially successful. At length the plan was adopted, of inserting a ring on the end of the axle, which ring turns in a groove within the box. This, by distributing the oil equally, and in due quantity, was found to obviate all inconvenience, and appears completely to answer the purpose.

"From the very commencement of the Baltimore and Ohio Railroad, it was fondly anticipated, as well by the public at large, as by those who were more immediately interested, that steam power should be used in transportation. By the time that one road had been constructed far enough to admit of making a trial of travelling upon it, the railroad system had made considerable advances in England, and there steam power had been used with great success. Glowing and flattering descriptions of the efficiency of British locomotives had reached this country, just at the time when the railroad system strongly laid hold on the public mind. In this state of feeling the railroad company were called upon immediately to import a complete English locomotive, of the most approved construction, for the double purpose of ascertaining, by actual experiment, whether our railroad was adapted to the application of steam power, and, also, if the experiment should prove successful, that it might serve as a model to American machinists. The President and Directors of the Baltimore and Ohio Railroad Company, actuated by the laudable motive of encouraging and eliciting native talent and ingenuity, offered, through the medium of the public journals, a premium for a locomotive engine, possessing certain specified powers, but limited with such conditions, as to weight, size, and other circumstances, that, although some engines were produced, constructed under the stipulated limitations, it was found they would not answer. The machinist who, in the first effort, had approached the nearest to the accomplishment of the object of constructing a locomotive possessing the requisite power and speed, was encouraged to attempt another, unrestricted by any conditions that would interfere with the effect. In consequence, an engine, named the Atlantic, was in due time put upon the road for experiment, and, after the trials necessary for the adjustment of the several parts, one to the other, so as to produce harmonious action, and regulate the fan in such a manner as to keep up the heat to the proper degree of intensity; it was put upon actual service in the month of August last, and has continued to perform the trip of eighty miles daily, with the entire train of passenger cars, to and from the inclined planes, at an average rate of not less than twelve miles an hour; clearly demonstrating the practicability of employing steam power on this road to advantage, and most fully and satisfactorily proving that, when a sufficient number of engines shall be in active operation on the road, transportation may be performed by steam power, at about one-half the cost of horse power. It would, therefore, appear, that the interests of the railroad company are materially concerned in placing in operation, as soon as practicable, a num-



ber of efficient engines, sufficient to secure the regular uninterrupted line of traveling upon the road. Until this is done, it is apprehended that no reduction can be made in the expense connected with the present mode of transportation by horse power.

" Previous to the first of March last, when the present superintendent of machinery was appointed, there were upon the road 363 burthen cars; between that time and the present date there have been constructed 167 cars, of the following descriptions, viz :

70 House cars, for merchandize, at an average cost of \$143,39

76 Box cars, with canvass covers, for lime, flour, &c., do., 126,67

21 Platform cars, for lumber, stone, plaister, &c., do., 114,64

Making the total number 530, nearly the whole of which are in good repair, and fit for use.

" The frequent loss of small and valuable articles of merchandize, and the occasional injury to such as were liable to damage from the weather, suggested the propriety of constructing the house car, in which the goods might be preserved from depredation and injury. This improvement appears fully to answer the purpose; and, while it has promoted the interest of the company, it has met the public approbation. The cars are now constructed with a view to the different kinds of commodities conveyed on the road, and the brakes have been so improved, that transportation may be considered safe. Materials are provided, and the requisite arrangements made to furnish, within a short period, the additional number of cars necessary to meet not only the present exigency, but also any increased demand that can be reasonably calculated on for some time to come.

" There are at present thirty-six passenger cars in good repair on the road; two coaches are also now being built at the company's shop, on Charles street, which will shortly be ready for use.

" The locomotive, York, which was, in the first instance, placed on the road as an experiment, is now undergoing a course of alteration and repairs, and is expected soon to be in a condition to ply between Baltimore and Ellicott's Mills. From the nature of the improvements now in progress, sanguine hopes are entertained that the performance of this engine will be efficient and satisfactory, and that its powers will be equal to the transportation of all the passengers on the first division of the road.

" The experiments that have been made of the steel springs on the engine and tender, have furnished evidence of their utility in regulating the motion, and greatly diminishing the jar and consequent injury to the road. This has suggested the propriety of making a further experiment, by placing a few of the burden cars on steel springs. By this improvement it is calculated that a car thus fitted up with springs, will admit of one third more loading without any increase of damage to the road or car, and that it can be propelled by the same motive power that the present fixture of the cars and their weight of load require. The passenger coaches can also be fitted up with springs at the same or even a less expense than the present arrangement involves. In fitting up the burden cars with springs, an additional cost will be incurred, but the advantage gained, it is believed, will much more than compensate for the increased expenditure.

" An improvement in the vibrating box is now about to be brought to the test of experiment. This will involve no additional cost, and in the opinion of those who are capable of judging in such matters, promises a favorable result by affording, in the motion of the cars, a more easy accommodation to the curvatures of the road.

" For a detailed statement of the expenditures of this department, I refer to the annexed document, marked K, No. 1.

Respectfully submitted, by **GEORGE GILLINGHAM,**  
*Sup't Machinery, B. & O. R. R.*

State fully and particularly.



[The Plaintiff's Attorney here hands to the witness the same book. To which the Defendant's Attorney repeats his aforesaid objections, and also objects that the matters therein stated are not proved to be within the legal knowledge of the alleged reporters.]

A. This [?] also a correct quotation of the words here printed. The introduction of the ring here mentioned, for oiling, is my invention, or rather my production, for the purpose. Also the box that it worked in—the pattern was made by me.

X Q. No. 395. Will you now look at the 43d page of the "Seventh Annual Report of the President and Directors to the Stockholders of the Baltimore and Ohio Railroad Company, for the year 1833," herewith handed you, and marked "Plaintiff's Exhibit No. 6," and state whether you do not find commenced on said page—"Report of J. Knight, Chief Engineer, in relation to the proposed Railroad between Baltimore and Washington"?

And do you or not find on the next page of said report the following language?—

"Without further preface I now proceed to the calculations and comparisons just alluded to, under the five following heads, viz:—

"I. Estimates of the probable cost of the graduation and masonry.

"II. Repairs of the graduation and masonry.

"III. Estimates of the probable cost of the railway, and of the repairs and renewals of the same.

"IV. Motive power and machinery.

"V. The comparison of the twelve routes."

If yea, will you turn to said head IV., on page 104, of said document, and state whether you do not find it as follows, to wit:?

*"IV. Motive Power and Machinery.*

"The moving power will be steam, with locomotive engines, each locomotive weighing, with fuel and water, say  $6\frac{1}{2}$  tons, and to work with the adhesion of two wheels, and a weight of four tons through them. The boiler to be upright and tubular, and the fuel anthracite coal. The wheels to be chilled cast iron, three feet in diameter, and geared to the requisite speed. The engine will be accompanied with a separate tender carriage, upon four wheels, the weight of which, with the tank, water and fuel, will average five tons. The prime cost of the locomotive engine, and its appurtenant machinery, \$4,000; and of the tender and its appurtenances, \$360.

"Locomotives of different descriptions of boilers and wheels may, however, be employed.

"We shall now proceed to form the necessary estimates under this head.

Prime cost of cars.

Wheels, 30 inches diameter, each 210 lb., per car 840 lb., at 40 cts. including 1-4 ct. for chill), . . . . .	\$33.60
Axles 140 lbs. each, per car, 280 lbs., at 10 cents, . . . . .	28.00
Fitting up wheels and axles, per car, . . . . .	14.48
Four boxes, chilled, 98 lb., at 4 cents, . . . . .	3.92
Cost of wheels, axles, and boxes, per car, . . . . .	<u>\$80.00</u>
Platform car, for stone, flour, &c. . . . .	<u>\$80.00</u>
Wheels, axles, and boxes, as above, . . . . .	\$80.00
Iron work in body, 50 lbs., at $12\frac{1}{2}$ cts., . . . . .	\$6.25
Wood, wood work, and brake, . . . . .	27.75
Car body, . . . . .	<u>34.00</u>

# 532 DEPOSITION OF CONDUCE GATCH, FOR RESPONDENTS.

Steel springs, 140 lb., at 16 cts, . . . . .	\$22.40
Castings for do, 35 lb., at 4 cents, . . . . .	1.40
Bolts, &c., . . . . .	1.00
	<hr/>
Cost of steel springs and appurtenances, . . . . .	\$24.80
Cost of each platform car with springs, . . . . .	\$138.80
Weight of car, 2,300 lbs.	<hr/>
Box car, for coal, lime, flour, &c.	
Wheels, axles, and boxes, as above, . . . . .	80.00
Iron work of body, 50 lb., at 12½ cts., . . . . .	\$6.25
Wood and wood work, . . . . .	39.75
	<hr/>
	46.00
Steel springs, . . . . .	24.80
	<hr/>
Cost of box car with springs, . . . . .	\$150.80
Weight of car, 2,400 lb.	<hr/>
House Car, for Dry Goods, &c.	
Wheels, axles, and boxes, as above, . . . . .	\$80.00
Iron work of body, 55 lbs., at 12½ cts., . . . . .	\$6,87½
Wood and wood work, . . . . .	45,12½
	<hr/>
	52.00
Steel springs, . . . . .	24.80
	<hr/>
Cost of House car, with springs, . . . . .	156.80
	<hr/>
Weight of car, 2,600 lbs.	
Passenger Car, or Coach.	
Wheels, axles, and boxes, as in burthen cars, . . . . .	\$80.00
Bodies, including springs, brakes, &c., . . . . .	620.00
	<hr/>
	\$700.00
	<hr/>

Weight of car, 2,600 lbs.

“The diameter of the wheels is assumed at 30 inches, that size affording a good and cheap cast-iron chilled wheel; nevertheless, the diameter may be enlarged to 36 inches, should the consequent increase of effective power be considered as warranting the more costly wheel, a point upon which there is doubt.”

And does not the enumeration of the kind of cars thus end?

[Objected to by Defendant's Attorney, as not evidence, and particularly as not evidence that the facts, as stated in the said book, are matters within the absolute knowledge of the alleged reporters.]

A. The quotation is correct, as printed here. As far as I am able to judge from what is read of the report, the enumeration of the kind of cars does end there.

X Q. No. 396. Does not the subject then change to the cost of the annual repairs of those several kinds of cars?

[Objected to by Defendant's Attorney.]

A. The following paragraph is headed “Annual cost of cars.”

Thereupon adjourned until to-morrow morning, the 25th day of May, 1853, at 10 o'clock, A.M.

On this 25th day of May, 1853, at 10 o'clock, A.M., appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, Charles D. Gould, Esq., Attorney for the Plaintiff, and the

witness, Conduce Gatch, and I thereupon further proceeded with the deposition of the said Conduce Gatch, as follows, to wit :

X Q. No. 397. Will you now turn to the printed copy of the "Eighth Annual Report of the President and Directors to the Stockholders of the Baltimore and Ohio Railroad Company," for the year 1834, "Printed by William Wooddy, No. 6, S. Calvert street, Baltimore, 1834," and state whether you do not find, on the 11th page of the Report, signed by the President of said company, Philip E. Thomas, on behalf of the Board, under date of October 6th, 1834, the following language, to wit : ?

"The facilities which were anticipated in the last annual report, from the erection of work shops for the construction of engines, on the company's depot, have been fully realized, and will become more and more important as the number of engines increase, and the entire transportation of the road is effected by them."

"In the other departments of machinery there have been several valuable improvements tending to simplicity of construction, and the diminution of wear and tear."

"After the experience of several years, the Board have come to the determination of employing an eight-wheel car, invented by Ross Winans, for the transportation of passengers. This consists of two sets of ordinary running gear, with steel springs, each set having what may be called a rose bolt, equidistant from the centre of motion of each wheel. The two sets are placed at the desired distance apart, and connected by a frame stiffened by a thin iron plate on the sides, on which frame the body of the car rests. The great advantage of this mode of construction, consists in the steadiness of the car, when moving on a curved road, or on one whose surface is uneven, or slightly out of repair ; for the two sets of wheels accommodate themselves to the inequalities of the surface, without affecting the car, resting as it does on the centre of each set. Another important object which is attained, is safety; for while in the ordinary four-wheeled cars, the breaking of a wheel or axle might be productive of the most fatal consequences, such could not be the case where, with eight wheels, there would be enough left to support it on the track, until the train could be stopped. Again, upon a curved road, it is necessary to place the pairs of wheels of a four-wheeled car, as near as possible, so as to diminish friction, and this makes it necessary to build the body of the car very short, to prevent a disagreeable, and at times, dangerous vibration from side to side, while the car is in rapid motion. In the eight-wheel cars, on the contrary, the pairs of wheels of each set, are placed as near together as can be desirable, under any circumstances, and the sets themselves may be as far apart as may be necessary to accommodate a car of any length, without increasing the friction on the rails when passing curves of the least radius or producing the lateral motion complained of. In point of economy too, this mode of construction is much preferable to the one hitherto employed."

"For further particulars in relation to this department, the Board refer to the reports of the proper officers hereto annexed, [see appendix A, B.]"

Now turn to appendix A, just referred to, and state whether it is not titled "Fifth Annual Report of the Chief Engineer of the Baltimore and Ohio Railroad—Engineer's Office, Baltimore and Ohio Railroad. Baltimore, October 1, 1834. To Philip G. Thomas, President of the Baltimore and Ohio Railroad Company." And if yea, do you not find, on the 26th page of said document, as part of it, the following language ?

"Coaches for passengers have claimed the serious attention of the engineers and

officers of this company within the past year; and it has been found on trial, that a coach upon eight wheels is easier, and every way more comfortable to the passengers, cheaper in cost of construction and repairs, and less injurious to the railway in proportion to the number of persons carried; the motion being more smooth than those of four wheels. When eight wheels are employed, each end of the coach is supported by a frame having four wheels, the two pairs of which may be as near together as will permit the flanges of the wheels, two and two, to revolve, without being in contact with each other. In this way, each set of four wheels will traverse a curved road easier than when the axles are further apart, as they necessarily must be in a coach with only four wheels; the coach has strong side frames of wood, plated with iron, and rests, with bolsters, upon the wheel frames, to which it is attached by means of a rose or centre bolt, permitting each set of wheels to assume, independent of the other, any direction the road may require. These coaches may have apartments to contain from eight to twelve persons each, whilst the number of apartments in a coach may be three, four or even five. Coaches with eight wheels will be safer from accident, it is believed, than with four wheels; in fact, they are much more convenient and appropriate, in all respects, for railway conveyance; and this kind of coach has accordingly been adopted."

"Steel springs are still being placed upon the burthen cars as well as upon the coaches, and with evident economy in every respect."

Now turn to appendix B, above referred to, on the 29th page of said document, and state whether you do not find it entitled as follows: "[B]" "Office of the Superintendent of Machinery, October 1st, 1834. —To Philip E. Thomas, President of the Baltimore and Ohio Railroad Co.;" and if yea, do you not find, as part of it, on page 31, the following language, to wit:?

"The machinery now on the road and in active use is as follows:

*"Locomotives.*

"1st. The Atlantic, now undergoing an alteration which will render her equal in power to the other engines more recently built.

"2d. The Traveller, employed in the transportation between the Mount Clare depot, and Ellicott's Mills, of passengers and goods.

"3d. The Arabian, which continued for fifty days in succession, to run from the depot to the Planes, with the Frederick train of passenger cars, the daily expense being as follows:

Coal, 1-4 ton, at \$6 per ton,	\$7,50
Engineer,	2,00
Assistant do.	1,50
Oil,	50
Interest on cost,	75
Contingencies,	1,00

\$13,25

"To this it will be safe to add three dollars per day for repairs that may become necessary, to maintain the engine in good order."

"4th. The Mercury, of the same power as the Arabian, has been running twenty days at the same daily expense as stated above."

"The above mentioned four engines were built by Phineas Davis, who from his first effort in constructing the York, to the full attainment of the herculean powers of the Arabian and Mercury, has made rapid advances in perfecting these machines, affording encouraging prospects of still further improvements. As far as the experiment has been made, the cost of transportation is lessened, and it has al-



ready been ascertained, that when steam power shall be so far employed as to enable us to dispense with horse power, the balance will be found materially to preponderate in favor of the former."

"Four new passenger cars have been constructed during the present year, viz:

1st. The Winchester, carrying thirty-six passengers, on eight wheels.

2d. The Dromedary, a large and commodious car, eight wheels.

3d. The Comet, a car with five bodies, carrying forty passengers, eight wheels.

4th. The Patterson on four wheels.

"Four of the old cars have been repaired, and placed upon eight wheels."

"All the other cars are in a respectable state of repair, and will probably do service through the ensuing winter, with but little additional expense."

"The number of burden cars now in the service of the Baltimore and Ohio Railroad Company, is 1,000, exclusive of 27 employed on the Washington road."

"The passenger cars hitherto in use on this road, generally resembled, in many respects, the usual stage coaches. Most of those built within the present year, are materially different from them in appearance and arrangement. The bodies are long, and supported on eight wheels, which are so placed as to pass the curvatures of the road with greater facility than the ordinary kind of car. These are not only made commodious, but they afford additional security to the passengers. They are simple in construction, and very strong, and consequently will seldom require any repairs, by which a great saving will be effected. During the time these carriages have been in use, several further improvements have been suggested, and a plan is now adopted, which it is thought, when introduced, will be very safe and commodious, and meet the public approbation."

"The total number of passenger cars now on the road, is 34."

"The ten passenger carriages ordered to be built for the Washington railroad, and which, when completed, will convey upwards of 350 passengers comfortably, are now under construction, and will be ready for service, as will also the new locomotive engines intended for that road, by the time it is finished."

"In relation to the duration of wheels, it may be stated that those with metal rings in them, upon the following named passenger coaches, have performed as underneath, whilst several of the same wheels present but little appearance of deterioration, viz:

The coach President,	309 days,	82 miles per day,	.	.	25,338 miles.
" " Virginia,	300 " " " "	.	.	.	24,600 "
" " Alleghany,	290 " " " "	.	.	.	23,780 "
" " Shenandoah,	259 " " " "	.	.	.	21,238 "
" " United States,	242 " " " "	.	.	.	19,680 "
" " Pioneer,	220 " " " "	.	.	.	18,040 "
" " Maryland,	240 " " " "	.	.	.	18,450 "

7)151,126 "

Average, 1700 . . . 21,589 "

Respectfully submitted,

GEORGE GILLINGHAM, *Superintendent of Machinery,  
Baltimore and Ohio Railroad.*"

State to each fully.

The Plaintiff's Attorney here hands to the witness one of the same books before handed to him. To which the Defendant's Attorney repeats his aforesaid objections, and also that it is not evidence, and that the matters therein stated are not proved to be within the absolute knowledge of the alleged reporters, and the mode in which they derived their alleged information given.

A. The quotations are correct, according to the words here printed.

X Q. No. 398. Will you look at the "Ninth Annual Report of the President and Directors to the Stockholders of the Baltimore and Ohio Railroad Company for the year 1835," herewith handed you, and state whether you do not find as part of the report signed "by order of the Board of Directors, P. E. Thomas, President, October 1st, 1835," on page 13, the following language, to wit: ?

"The eight-wheeled passenger cars, mentioned in the last annual report, have been fully tested, both on the Washington branch and on the main stem, and are found to combine safety, convenience, ease of motion, and economy. They are considered far preferable to the common four-wheeled cars, in all these particulars, and have been permanently adopted by the Board. The same plan has been applied to the burden cars, with equally favorable results."

"The machinery, generally, of the Company, has been much improved during the past year. The casting of the wheels has been brought to a perfection which removes all fear of accident from their breaking, even at the highest velocities. The revolving platforms invented by John Elgar, and used at the Mount Clare depot engine house, are superior to any heretofore constructed. The present brakes for passenger cars, suggested by Evan Thomas, have proved most efficient and durable. A new form of blowing apparatus, combined with a contrivance for heating the water, before it is pumped into the boilers, has been invented by Ross Winans, and has produced increased efficiency. In fine, the Board have every reason to be satisfied of the policy of having their machinery manufactured in the shops of the company, where suggestions, growing out of the experience afforded on the road, can at once be made available."

"The number of locomotive engines now in use is 7, of passenger cars 44, of which 25 are on eight wheels; and of burden cars 1,078, of which 48 are on eight wheels. [See Appendix, Document D.]"

Turn to document [?] document D, just referred to on page 167 of said ninth annual report, and state whether it is not as follows, to wit:

"[D.]

"OFFICE OF THE DEPARTMENT OF MACHINERY B. AND O. R. R. Co., }  
October 1st, 1835. }

"In making the annual report of the present amount and condition of machinery in his care, and also of the improvements in construction that experience has suggested during the past year, the undersigned begs leave to submit the following, viz:

"There are now in actual service upon the road, 7 locomotive engines, 1,030 burden cars on four wheels, 48 burden cars on eight wheels, 44 passenger cars, of which 25 are on eight wheels, the rest on four wheels.

"Of the 110 burden cars ordered by the Board and put under contract, 48, as above stated, are in actual service. The remainder are in that advancement of progress, that, as soon as the wheels and axles and the bolsters can be furnished, they will be ready to be put up and brought into service.

"The necessary attention has been paid to keeping all the machinery in as complete a state of repair as was practicable; and, in the construction of that which has been made new during the year, alterations which experience has demonstrated to be improvements, have been made. The plan adopted of placing the cars, both for the transportation of passengers and of merchandise, upon eight wheels instead of four, together with improvements made in the running gears, appears to be attended with the most happy results. These alterations and improvements, it is confidently believed, will materially tend to the comfort and safety of the passengers, as well as to

the preservation of the more tender and perishable articles of commerce. At the same time, the interests of the company will, most probably, be promoted by the increased durability of the machinery, which will be the necessary result of some, if not all, of these improvements. While it is believed that the machinery on the Baltimore and Ohio Railroad is in as advanced a state of improvement as that of any other railroad, yet it is not to be presumed that the *ne plus ultra* of perfection, in the construction, is yet reached. All that can be claimed, in this respect, is, that endeavors have been used to effect an approximation to that point. Farther advances in this career, must be left to the progressive march of invention in mechanical science. Respectfully submitted,

GEORGE GILLINGHAM, *Superintendent of Machinery.*

"To Philip E. Thomas, President of Baltimore and Ohio Railroad."

State fully.

[The Plaintiff's Attorney here hands to the witness the same book. To which the Defendant's Attorney repeats his aforesaid objections.]

A. This [?] also correctly quoted. The words are here printed.

X Q. No. 399. Will you now turn to the "'Tenth Annual Report of the President and Directors to the Stockholders of the Baltimore and Ohio Railroad Company, for the year 1836," herewith handed to you, marked "Plaintiff's Exhibit No. 7," and state whether you do not find appended thereto, the "Seventh Annual Report of the Chief Engineer of the Baltimore and Ohio Railroad," dated "Baltimore, October 7, 1836," addressed to "Joseph W. Patterson, Esq., President of Baltimore and Ohio Railroad Company?" and if yea, do you not find, commencing on the 20th page, the following language, as part of it, to wit?

"The construction of machinery during the year has, with few exceptions, been carried on successfully, and in a manner to insure the most satisfactory results. The passenger coach upon eight wheels sustains its character for convenience, comfort, and safety, whilst the cast-iron wheels, upon which it moves, continue to perform their office with the best economy and entire success. In proof of this it is but proper to state that, upon the coaches of the company having the highest speed, that is, between Baltimore and Washington, not a single wheel has been fractured or rendered useless from wearing since the opening of the road, more than thirteen months since; most of these wheels have run within this period about 30,000 miles, yet they do not show sufficient evidence of approaching failure to prevent their completing 50,000 miles; a distance more than double of that heretofore assigned for their performance. The managers of the transit upon other railroads have at length yielded to the proof we have exhibited, and are availing of this kind of wheel, not only in the transit of commodities, but likewise in the swifter movements with passenger trains."

"Whilst from the manifest convenience and safety of the coach with eight wheels, a decided preference is awarded to it, over that with only four wheels, in the conveyance of passengers with locomotive engines,\* it must be acknowledged that the

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\* "The following paragraphs, from the Baltimore Gazette, of October 5th, and National Intelligencer, of October 7th, inst., appear to be just and appropriate, and they are therefore appended, by way of note, in confirmation of our opinions, in relation to these coaches.

"Baltimore, October 5.

"The account of a most disastrous occurrence on the Columbia railroad, necessarily suggests the inquiry whether it is not practicable to prevent such disasters occurring to passengers and railroad cars? We feel assured, from our own observation, that, by a proper construction of the cars, and a judicious mode of connecting



claim to a preference of the *double* over the *single* car, in the transit of commodities is not so clearly established. The cost of repairs will probably not be greater, and it may be somewhat less, in the double than in the single car; at the same time, the weight of the former exceeds that of the latter, having regard to the quantity of freight conveyed, and, consequently, in a train of eight-wheeled cars, the gross tonnage exceeds that in a train of four-wheeled cars, the tonnage of the commodities conveyed being considered the same in both cases. With the former, therefore, the pressure upon the road is greater, and should the friction or resistance be the same with each on a level, yet, upon ascents, the gravity would give a preponderance unfavorable to the car of eight wheels. It is hoped that a little more experience than has yet been afforded will allow a determinate comparison to be made between the two kinds of cars in question, and should it result in favor of the car with only four wheels, the preference would be on the side of a vehicle more convenient in cities and at depots, where it would be more easily moved by manual force than the more cumbrous car with eight wheels."

State fully.

[Objected to by the Defendant's Attorney, as not evidence, and particularly as not evidence that the facts, as stated in the said book, are matters within the absolute knowledge of the alleged reporters.]

them with the locomotive, and with each other, such a dreadful result from a similar cause would never be produced; and, as an evidence that our opinion is well founded, we refer to the well established fact, that no personal injury has ever been experienced by any passenger travelling on the railroad between this city and Washington.

"Although we have confined the above statement to the railroad between Baltimore and Washington, we might have extended it generally to the Baltimore and Ohio Railroad; but, we mean to say, that the cars used for passengers on the Washington Railroad, and those of a similar construction on the other road, are more peculiarly fitted to secure the passengers from all risk of injury. Their great size and weight render it almost impracticable to throw them off the track, even when the locomotive itself is thrown off; and the fact of their having four wheels and two axles to support each end of the car, would prevent any injury to the passengers by the breaking of one wheel or one axle. There are other protections in the mode of connecting the cars with each other, and with the locomotive, which are well calculated to increase the security of the passengers."—*Gaz.*

"*Messrs. Editors*: In the account in your paper of yesterday, of the accident on the Columbia Railroad, by the breaking of an axle, the question is asked, how is this to be remedied?

"Allow me to suggest, as a very efficient method, the plan of the passenger cars on the Washington and Baltimore road. These cars are the best constructed for security to passengers as well as speed, of any that have yet come under my observation.

"Security in this: the cars are on four axles and eight wheels. If an axle or wheel were to break the car would still maintain its upright position and place upon the track. Two axles might give way, or the wheels on two axles, if one were a forward or one a hind axle, and the car still keep its place. Also, if two wheels on both forward or after axles were to break, provided they were not on the same side, the car would still keep its place. In fact, it would require the singularly coinciding accidents of the two forward or the after axles to break at the same time, or both wheels on the same side of either the forward or after pair of axles, to throw these cars off the road, or destroy their upright position. They are, therefore, in all human probability, placed beyond the reach of accidents from the breaking of the axles or wheels.

"Of speed: these cars are large; adapted to carry about fifty passengers, or as



A. The quotation is correct as here printed.

X Q. No. 400. Will you now turn to page 72 of the "Plaintiff's Exhibit No. 7," and state whether you do not find on said page, the following language, as a part of the report of the Superintendent of the Baltimore and Ohio Railroad, to wit?

"[C.]

"BALTIMORE AND OHIO RAILROAD OFFICE, }  
1st October, 1836. }

"J. W. PATTERSON, Esq., *President Baltimore and Ohio Railroad Company.*

"Sir: I have the honor to enclose herewith, tabular statements of the operations of the main stem and Washington branch of the Baltimore and Ohio Railroad, for the year ending 30th September, 1836."

And if yea, do you not find on the 74th page of the same report, the following language, &c., to wit?

"The means of transportation at present, on both roads, are as follows:

11 first rate locomotive engines, 9 of them in constant use.

1 second rate do.

980 4-wheel burden cars.

82 8-wheel do.

27 8-wheel passenger cars.

19 4-wheel do.

78 passenger horses, of which 25 are employed in the streets of Baltimore, and 19 at the inclined planes, the residue at different points on the road.

95 tonnage horses, 27 of which are at work in the streets of Baltimore, 28 on the road east of planes, and 8 west of planes.

60 mules; 46 of which are at work on road east of planes, and 14 west of planes.

Respectfully submitted,

H. W. FITZHUGH, *Superintendent B. and O. R. R.*"

State fully.

[Objected to by Defendant's Attorney, as not evidence, and particularly as not evidence that the facts, as stated in the said book, are matters within the absolute knowledge of the alleged reporters.]

A. The quotation is correct as here printed.

many as are generally put in three of the smaller kind of cars, which run on two axles and four wheels. The three cars, then, have to overcome the friction of six axles and twelve wheels, in doing the work of which one of the large cars is capable, and which have to overcome only the friction of four axles and eight wheels. They require, therefore, a less power to move them, or move with greater speed under the same power.

"There are other advantages in the large eight-wheel cars. They concentrate in one mass rather less than the weight of three smaller cars. From this concentrated weight they are not so much under the power of the engine; that is, not so easily thrown about or thrown off by it. Instances have happened on this road, (the Baltimore and Washington,) in which the engine has been thrown off the track without taking the cars with it; the weight of one (as it is generally but one car, that next the engine, which offers the first and principal resistance in such a case) being more than the engine could control, its fastening broke, and the cars kept their place.

"Also, if an axle or wheel were to break off one of the large cars, it being still maintained upright and on the track by the remaining axles and wheels, the train could move on, certainly until the engine was stopped, and probably with care and diminished speed, to the termination of the trip.—*Intel.*"

X Q. No. 401. Will you now turn to page 46 of "Plaintiff's Exhibit No. 5," and state whether you do not find there, as part of the communication of Jonathan Knight, chief engineer of said road, to Philip E. Thomas, President, under date of February 1st, 1830, the following language, to wit?

"With flanges on the outside, we should be compelled to forego the aid of this principle; for it is a fact, well settled in England, that to ensure the duration of wheels beyond a brief period, it is absolutely necessary to case-harden the faces of the rims by casting them in iron chills."

State fully.

[Objected to by Defendant's Attorney, as not evidence; and particularly, as not evidence that the facts, as stated in the said book, are matters within the absolute knowledge of the alleged reporters.]

A. The quotation is correct as here printed.

Thereupon adjourned until to-morrow morning, the 26th day of May, 1853, at 10 o'clock, A. M.

On this 26th day of May, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney of the Defendant; Charles D. Gould, Esquire, Attorney for the Plaintiff; and the witness, Conduce Gatch; and thereupon I further proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

X Q. No. 402. Will you turn to "Plaintiff's Exhibit No. 5," page 15, and state whether you do not find there, as part of the report of the chief engineer to the President and Directors of said road, the following language, to wit?

"In the location of the Baltimore and Ohio Railroad, it had frequently been found necessary, in consequence of the unevenness of the ground, and the sinuosities of the ravines to be traversed, to submit to curvatures of a radius of four hundred feet."

"Hence, one rail being longer than the other, sliding must take place over the difference of the distance; and, as much more power is required to slide than to roll the wheels, consequently much loss of power would ensue, unless it should be prevented by a conic surface to the wheel, which should cause it to run on the rail with circumferences of different lengths. The conic form is also necessary to keep the flange from the rail, as well on the straight as on the curved parts of the way. The experience of the English, on their railways, had led them to give a conic form to the wheels, more especially for the latter purpose. But it became us, under the circumstance of the greater curvature of our road, to look well to both objects."

State fully.

[Objected to by Defendant's Attorney, as not evidence; and particularly, as not evidence that the facts, as stated in the said book, are matters within the absolute knowledge of the alleged reporters.]

A. Correct quotation as here printed.

X Q. No. 403. Did not Michael M. Glenn and Washington O. Frost work in said shops, under your superintendence, on all the kinds of work done at said shops by wood-workers, from August 1, 1830, to the time when the car Columbus was turned out of said shops, and did they not also work upon said car? state fully.

A. They both worked in the shops under my direction, but were both considered rather inferior hands, and did not work on the best work done in the shop; possibly both of them might have worked on some portions of the car Columbus.

X Q. No. 404. For what purpose, in 1830 and 1831, were four-wheel platform cars constructed and used single, not in pairs, in which cars the flanges of the wheels were but three inches apart? state particularly.

A. There were four-wheel cars constructed in 1830 and 1831, that is platform cars, with a double cross-piece or two cross-pieces in the centre, in order to strengthen them for the purpose of transporting lumber and cord wood, for carrying horses and carriages, sometime in 1831, the last mentioned cars.

X Q. No. 405. Repeated.

A. I can't comprehend the question.

X Q. No. 406. Were four-wheel platform cars constructed by you in said shops in the years 1830 or 1831; and in which year, to be used one four-wheel car at a time, in which cars the flanges of the wheels were but three inches apart? and if yea, for what special purpose were they constructed and used? singly? state fully.

A. There were cars constructed with flanges about that distance apart, and when used singly, used for the transportation of stone principally, and for other purposes when they answered. There were some of them used for transporting cord wood, and materials for the construction of the road, &c.

X Q. No. 407. Did any of these four-wheel platform cars have timbers laid along their upper surface, about four feet apart, and fastened down to the platform, in the ends of which timbers standards were placed for the purpose of carrying cord wood on said road, in 1830 or 1831, and in which year? state fully.

A. There were a great number of cars used for wood, in the latter part of 1831, prepared in various ways; some as mentioned in the question. Box cars were used, and holes bored in the platform and round sticks stuck in, all for transporting cord wood.

X Q. No. 408. Do you declare, under oath, that four-wheel cars, prepared as stated in the last question, were not used during the year 1830 for carrying cord wood, and do you not know that they were so used in that year?

A. I have no doubt they were used in 1830, and the reason why I mentioned 1831 especially was, that it was an uncommonly long and severe winter, and immense quantities of wood were transported on the road. Almost every species of car that was available, and could be spared by the company for that purpose, was used.

X Q. No. 409. What necessities of the business of the road led you to make the eight-wheel cord wood car, as heretofore declared by you? state fully and particularly.

A. The demand for the transportation of wood, and the best and most suitable car for the transportation of wood. The mode of construction grew out of the eight wheel car used for carrying lumber, long timber on the road.

X Q. No. 410. Did the said eight-wheel cord wood car carry as a load more than double the proper load of a four-wheel car?

A. Not generally, I think.

X Q. No. 411. In what respect was the said eight-wheel cord wood car the best and most suitable car for the transportation of wood?

A. A great deal less liable to jostle off. The inequalities on the road through the curves and switches had not the same tendency to derange the load and throw it off. Not subject to tilting in case there was more placed at one end than the other.

X Q. No. 412. Were these eight-wheel cord wood cars much talked about in 1830, and was then foreseen by you the great advantages now had in the eight-wheel car in general use? state fully.

A. They were talked about, but how much I cannot tell. The advantages were foreseen by me, not only from the building of the wood cars, but from the carrying of lumber upon bolsters also.

X Q. No. 413. Do you claim to have first invented the eight-wheel railroad car, as now built and in general use on the railroads of this country? and if yea, at what time did you plan or build a car containing the peculiarities of the said cars? state fully.

A. I claim to have introduced the principle of an eight wheel car in the carrying of timber for the construction of the Baltimore and Ohio Railroad, with further improvements in the construction of cars for carrying wood, and for transporting horses and carriages. And in 1831, March, I planned the running gears of the car Columbus. In March, 1831, I planned and built the running gears of the first eight-wheel passenger car, built for the Baltimore and Ohio Railroad, which car exhibited the principle of the eight-wheel cars now in use generally.

X Q. No. 414. Will you explain what you mean by the word "principle," as applied to eight-wheel cars, and as used by you in your last answer?

A. What I consider the "principle of an eight-wheel car," is so to construct two four-wheel trucks or cars, so to arrange them under the load, whether of lumber or passengers, so as to enable each truck or car to change its position to the load resting on it to any angle required, by which means it passes through the switches and curves of a railroad, the points or centres upon which the load rests being brought to a small focus or bearing.

X Q. No. 415. By "focus or bearing," do you mean making the bolsters so that they swivel on each other round a king bolt, or what do you mean?

A. I mean the point or surface on which the load rests on the trucks.

[Recess until four o'clock, P. M.]

X Q. No. 416. In what respects would you alter the plan of an eight-wheel car for a road having a rail of seventy pounds per lineal yard, and with no curves of less than three thousand feet radius, from the mode in which you would plan it for a road with curves, with five hundred feet radius, and rail of thirty pounds per lineal yard, supposing the business to be done by the car on both to be of the same amount? state fully.

[Objected to by Defendant's Attorney.]

A. I am not in the business of building cars or railroads now—it



would take some reflection to answer that question; I don't feel disposed to answer that question.

*X Q. No. 417.* Did you not observe that in the reports of the Chief Engineer of said road, and also in those of the superintendent of machinery, for the years 1830 and 1831, that "two kinds of cars" were alluded to as being on said road, of which it is remarked that it is intended "each kind shall be perfected to the highest degree," the quotations containing such remarks herein contained; and if yea, will you solemnly declare that the engineers of said road and the superintendent of machinery did not direct or directly authorize all the changes made in their proportions? state fully.

[Objected to by Defendant's Attorney.]

*A.* I did observe, in the quotations above alluded to, mention of two kinds of cars that were to be perfected. I do declare that no person but the superintendent of machinery had any authority over me or any business to give me any instructions concerning the construction of cars, and neither of the superintendents, Mr. George Brown or Gillingham, could make a correct drawing of a four foot square frame; and how Mr. Elgar got the name of engineer, I cannot conceive; for he understood nothing about drawing at that time. Nor do I know that Mr. Winans knew anything about drawing.

*X Q. No. 418.* I ask you simply and directly to state, after careful consideration, whether all the changes which were made in the proportions of both of the two kinds of burden cars, in use in 1830 and 1831, were not directed or authorized by the superintendents of machinery or the engineers of said company? state particularly.

[Defendant's Attorney objects to the question, and calls upon the Plaintiff's Attorney to specify what alterations, and what proportions, and in what particular parts, and in what cars, he is enquiring of.]

[The Plaintiff's Attorney answers that he is ready to make any thing more clear to the witness, in case the witness desires it.]

*A.* I say most positively, no; and, if the question refers to the durability and strength of timber of the various kinds used, I was better prepared to give proper judgment on the matter than any man in the concern.

*X Q. No. 419.* Do you declare that, in the year 1830, without direction from the engineer or superintendent of said road, you also directed the length and width of the body of the cars, the distance between the axles, the manner in which the timbers should be arranged in the frame, the manner in which the car should be arranged to be drawn, the distance between the draw pins, and the size of wheels and axles which should be used? state particularly.

*A.* I recollect distinctly of arranging the sizes of the bodies; as to the distance between the perch pins, there was no particular distance given. I gave no directions in reference to making wheels or axles; merely had the inspection of them after they were placed in my hands, to say whether they were fit for use or not. I purchased all the timber that was purchased for cars, and gave bills for sizes and qualities of timber to be cut to order for the company's use, had it inspected and hauled and paid the bills. The distance between the axles was governed entirely by the length of the body. There was no particular distance.

*X Q. No. 420.* What was the distance or proportion which the axles of such cars were placed from the ends, or what was the rule?

*A.* There was no general rule for placing the axles from the ends of the cars. There was no rule for fixing the distance of the axle from the end of the car body; it varied according to the length of the body.

*X Q. No. 421.* Will you look at Plaintiff's Exhibit No. 2, and state whether you have seen such cars in use? and if yea, where and to what extent, the said drawing being a copy of that filed in the Patent office?

[Defendant's Attorney objects to the question, and denies that the said drawing is a true and proper copy, as alleged in the question.]

*A.* I have seen such cars in use on the Baltimore and Ohio R. R.; to what extent I cannot tell, but to a considerable number.

*X Q. No. 422.* Please state whether such car is regarded by you as a valuable car or not, and for what purpose it is used; and at what speed is it commonly drawn?

[Objected to by Defendant's Attorney.]

*A.* I consider an eight-wheel car a valuable car; it is used for the transportation of merchandize of various kinds; at what speed it is drawn I do not know; it is made a good deal more valuable from the use of my plan of springs and cast iron pockets.

*X Q. No. 423.* Is it a fair representation of the cars which have for many years been used on said road? state particularly.

*A.* With the exception of these detached iron bolsters, that are on this drawing, it is a tolerably fair representation of the mode of construction of cars in 1835; the detached iron bolsters have long since been thrown away. Some were constructed with iron bolsters, in 1835, and some with wood; the iron bolster was an experiment.

Thereupon adjourned until to-morrow morning, 27th May, 1853, at ten o'clock, A. M.

On the 27th day of May, 1853, at 10 o'clock, A. M., William W. Hubbell, Esquire, Attorney of Defendant, and Charles D. Gould, Esquire, Attorney of the Plaintiff, and the witness, Conduce Gatch, appeared before me, the Commissioner; and the cross-examination was read over to the witness, and he desired to correct the same if there should be any errors therein,—but said witness did not desire any corrections to be made therein.

LEVIN GALE, *Commissioner.*

C. GATCH.

Thereupon adjourned until to-morrow morning, the 28th day of May, 1853, at 10 o'clock, A. M.

On this 28th day of May, 1853, at 10 o'clock, William W. Hubbell Esquire, Attorney of the Defendant, and Charles D. Gould, Esquire, Attorney of the Plaintiff, and the witness, Conduce Gatch; and thereupon I further proceeded with the examination of the said Conduce Gatch.

And the said Conduce Gatch, being RE-EXAMINED on the part of the Defendant, further says, as follows, to wit:

*Q. No. 424.* Was Jonathan Knight a Civil engineer only, or was he a Mechanical engineer, or Machinist, by occupation?

[Objected to by Plaintiff's Attorney.]

*A.* A Civil engineer, I always understood.

*Q. No. 425.* What was John Elgar's employment before he went into the service of the company, or when he worked for George Gillingham, at what did he work?

[Objected to by Plaintiff's Attorney.]

*A.* He worked journeyman's work, at a turning lathe,—turning iron.

*Q. No. 426.* Where did Ross Winans come from, or was he reported to come from, and what was his employment or business, or his reputed employment or business, before he appeared with his friction wheel car?

[Objected to by Plaintiff's Attorney.]

*A.* I understood he came from the State of New Jersey. I understood he was a wood turner,—a spinning-wheel maker.

*Q. No. 427.* What was George Gillingham's employment, and did he do work for you before he became superintendent of machinery?

[Objected to by Plaintiff's Attorney.]

*A.* George Gillingham carried on a blacksmith's shop; yes, he fitted up mill spindles, and worked on mill machinery, for me.

*Q. No. 428.* What became of Phineas Davis, and in what business are George Brown and William Woodville engaged at the present time?

[Objected to by Plaintiff's Attorney.]

*A.* Phineas Davis was killed on the Washington Branch of the Rail Road. Mr. Brown is in the shipping business and exchange. Mr. Woodville is a stock and exchange broker, I think.

*Q. No. 429.* Have you continued to pursue your profession of a Millwright and Machinist, since you left the service of the company, in April or May, 1834, and are you now building a large mill on the City Block, by contract, for Mr. Abbott, and containing late improvements made by you?

[Objected to by Plaintiff's Attorney.]

*A.* I have continued to pursue my Profession of a Millwright and Machinist, since I left the service of the company, in 1834. I am now building a new mill for Mr. Abbott, and introducing improvements not before used in this State.

*Q. No. 430.* Is Ross Winans reputed to have gone to drawing school, to learn to draw, or make drawings, since the year 1831?

*A.* I understood, at one time, that he went to drawing school; the time I cannot tell; since 1830, I believe it was.

*Q. No. 431.* Were you the only regular master Machinist or Master carpenter, by profession and occupation, that had charge of the construction of cars, from the early part of 1830, to April or May, 1834, when you left the employ of the company to pursue your profession as a millwright and machinist?

*A.* I was the only man in the employment of the company, that I knew of, who could make a regular drawing, to a scale, and also work by it.

Q. No. 432. Will you now look at "Plaintiff's Exhibit No. 5," on page 37, and state if you find the following words commencing on that page?

"[No. 1.]

"Baltimore, February 1st, 1830.

"To Philip E. Thomas, President Baltimore and Ohio Railroad Company."

"The question whether the flanges of the wheels of the railroad cars should be made to run upon the inside or upon the outside of the rail, has reurred in consequence of continued contemplation in relation to the several circumstances which will necessarily be connected with the moving power and its machinery, and especially in consequence of the sentiments on the subject contained in two successive communications from W. Brown, of Liverpool, to Alexander Brown and Sons, here. In the first it is stated, in substance, if I recollect rightly, that the experiments made on the Liverpool and Manchester Railway, with cars constructed on the Winans principle, indicated that the flanges might be on the inside without any disadvantage in the movement. In the second, the subject is again adverted to, and strong fears expressed, lest we have adopted the outside arrangement, adding that the engineers there are decidedly in favor of the flanges being made to run on the inside of the rail. The reasons which had weight to induce me to assent to an arrangement to run the flanges on the outside, in preference to the inside, was the general opinion held by all concerned, including the inventor himself, that if not absolutely necessary to the successful movement of the Winans car, it would be greatly promoted by that arrangement, in consequence of the vibratory motion of the axles on the inner periphery of the friction wheels, and causing the axles to quickly change from the line of parallelism with each other. This change of position, it was believed, would tend directly, if the flanges were on the inside, to cause the car to run off the way; for the friction elicited by the contact of the flange with the rail, would make that wheel recede relatively as far as the play in the friction wheel would permit, and this would tend to keep the friction of the flange with increased energy. Whereas, if the flange were on the outside, the receding of the wheel would tend to release it from contact with the rail. The vibratory motion first mentioned, and from which it was expected the inconvenience stated would arise, was looked upon as one of the decided virtues of this car, because it was immediately inferred, that a deviation from parallelism of the axles, would facilitate the movement in those parts of the road which should be curved.

"These reasons, together with the strong probability that the superior advantages of the Winans car, to arise from the most happy application of the friction-wheel, which had yet been conceived, would recommend its general use, and that, in consequence of the great saving in friction, the use of the locomotive engine would be dispensed with, especially as its great weight at that time, and previous to the very recent improvements which it has undergone, would have been an insuperable objection to its use on our road. These reasons, I say, determined the outside arrangement for the flanges; and, accordingly, that portion of the single track already laid has been formed with that view. But the experiments and opinions first mentioned, together with much serious and anxious reflection, have induced me to set a less value on some of the circumstances enumerated, and have shaken my confidence in the correctness of the plan of running the flanges on the outside. And I should feel myself wanting in duty, were I not to make known to the Board, as soon as practicable, my opinions and convictions in relation to a matter of such importance. The road is not so far laid as to occasion very serious expense or inconvenience by making the change."

And on page 39, of the same publication, these words?

"When in England, this subject was diligently inquired into. Writers had evi-



dently not turned their attention to the subject, for the books on railroads were totally void of any reasons respecting the preference of the sides on which the flange should run. In that country the running of the flange of the wheel on the inside of the rail of the edge railway was found to prevail in all cases, without an exception, in practice; whilst no body appeared to give attention to the matter, further than to continue the arrangement, with the exception of George Stephenson, engineer, who had made some wooden wheels, the flanges of which he intended to try on the outside. It appeared that he had not investigated this subject, having before that time pursued the old plan, as he found it. But, receiving an additional impulse to his ingenious reflections, from the circumstance of having to project and make the Liverpool and Manchester Railway, a query had occurred to him whether or not the practice of running the flanges on the inside, in preference to the outside of the rail was best. He seemed at a loss for motives for a preference, but intended not to make a change, without experiment should indicate a decided disadvantage in the method in use. From the circumstance that the method previously pursued, has been continued to be preferred on that most important road, it may be inferred that he soon became satisfied that it was better to make no change in that respect."

And on page 45, of the same publication, these words?

"Let the flange be on which side it may, the conical form of the wheel must be adopted, to prevent the flange from coming too often in collision with the rail, and to cause it to leave the rail and recede from it. Nicholas Wood, in his *Treatise on Railroads*, p. 81, observes, 'The rim of the wheel is mostly made a little conical, rather increasing the diameter toward b,' (meaning the flange); 'this is for the purpose of keeping the wheels from rubbing against the sides of the rails with the ledge b,' the increase in diameter, when the wheel rolls near the inner side of the rim, tends to throw it off towards the other side, consequently from the side of the rail. It is evident that this ought not to be carried too far, otherwise the motion of the carriage will be very irregular, and the inclined position of the bearing would tend to press the rail outward, and throw a sort of oblique strain upon it. The height of the ledge is generally about an inch, and practice has shown this to be sufficient to prevent the carriages from running off the rails."

And on page 48, of the same publication, these words?

"The width between the rails.

"Should it be determined to run the flanges on the inside, an alteration of the parts of the road already laid must take place. In that case, the question, as to the most proper width between the rails will be open for further consideration.

"The width between the rails of a road for general traffic, or for passengers, should be greater than would answer for a road to be used exclusively for the conveyance of mineral or other like ponderous substances, for, with the latter, the load occupies less space, and the centre of gravity being *low*, the stability is increased:

"Tredgold recommends four and a half feet for the width in a road for freight, and six feet in a road for the conveyance of passengers, exclusively. The width between the rails, on the Stockton and Darlington, and also on the Liverpool and Manchester Railway, is four feet eight and a half inches. These roads are for the general purposes of trade, and for the conveyance of passengers also."

And on page 50, of the same publication, these words?

"If a car with small wheels should run off the way, the chances for injury are less than with large wheels. A car with small wheels will have to be coupled closer than one with large wheels, and on that account will turn in a curve easier, and will also have a more equal bearing on the wheels, axles, and road, in ascending or descending planes. It will also be easier loaded, and unloaded, in most cases."

"Now, when, in addition to what has been mentioned, we reflect that the diameters of the wheels in use on the English railways vary from fourteen inches to three feet, and that the more common size is two and a half feet, with the exception of the wheels of the locomotive engine, which is a peculiar case; and further, when we consider to what a small quantity the resistance is, and may be reduced, even with very low wheels,—is it difficult to see, with reasonable clearness, the limits of expediency?"

"On the whole, it seems to me, that a diameter of two and a half feet will combine as much advantage, with as little disadvantage, as any other dimension."

"Respectfully submitted,

J. KNIGHT."

State if the foregoing portions of the said report of J. Knight, are correctly quoted, as contained in said Plaintiff's Exhibit No. 5.

A. They are correctly quoted as here printed.

Will you now look at said Plaintiff's Exhibit No. 5, on page 17, and state if you find the following words?

"To accomplish this with a thirty-inch wheel, it became necessary, according to the principles before mentioned, to make the height of the conical rise at the flange, one sixth of an inch and an inconsiderable fraction over, whilst the base of the same should be *one inch*, and to secure a fair bearing, with the least friction on the straight parts of the *way*, to confine the conic part to the space allowed for the *play* of the flange, and to make the residue of the face of the wheel cylindrical, or as nearly so as compatible with *casting*; so that on the straight track, the cylindrical parts of the wheels should bear upon the rails, whilst the conic part should be off the rails, and occupy the space between the rails and flanges on each side respectively. Hence, when the car came upon the curved track, the conic part of the wheel would act upon the longer rail, whilst the opposite wheel would bear upon the rail with its cylindrical part; and thus, on account of the different lengths of the circumferences in action, both the wheels on the same axle would roll on without any sliding through all curvatures of a radius not less than four hundred feet. But this required a space for the *play* of the flanges equal to two inches; so that when the car should be on the straight track, each flange would be one inch from the corresponding rail. If the wheel was more than thirty inches in diameter, the space for play would be more than two inches; but if the wheel were less, then the space allowed for play would be proportionally less. The thirty-inch wheel was considered to combine more general advantages than any other. [See my communication of Feb. last, marked No. 1.] Hence the objects desired would be attained by allowing the flanges two inches of play. On account, however, of the rails being rounded at their edges to the extent of one eighth of an inch, the breadth for play was finally reduced to one and three quarter inches, since there would still be the space of one inch for the conical part, without necessarily bearing upon the rail in the straight track. Now, since the quantity of play allowed to the flanges of the wheels on the English railways was about seven eighths of an inch—and in no instance now recollected was it more than one inch—it was a question of moment whether we could venture to double that quantity without incurring counteracting evils, greater than the benefit to be derived from the use on our railway, of the proper conic form already described. The laying the railway, especially at the *crossings and turn outs*, to suit this enlarged play, and the effect it might possibly have in producing an unsteady movement of the car, from side to side, were considered; but it was seen that the first could be provided for by a little contraction of the breadth of the way at those parts, and it was finally believed that the second would not take place to any serious extent. I am happy to say, that so far as I may judge, from the experience already acquired, all the conclusions which have been previously come to in relation to the subject, have been verified. There

is a practical limit, however, which should not be transgressed, in respect to the play of the flanges; and it is probable that for high velocities it would not be proper to go beyond the breadth which we have allowed.

"The breadth of the track is such as to admit cars of the dimension used upon the Liverpool and Manchester Railway; that is to say, whose flanges are four feet, seven and a half inches apart, from out to out. The breadth of the Liverpool and Manchester Railway track is four feet, eight and a half inches, between the rails, and allowing an inch for the play of the flanges; whereas, the breadth of the track of the Baltimore and Ohio Railway, between the iron rails, is four feet, nine and a quarter inches; so as to allow one and three quarter inches play to the flanges of the same wheels, except only at places where it is contracted to about half the play, as before mentioned.

"It is confidently believed that the proper combination of the cone and cylinder, so as to form what may perhaps properly be denominated *the cone and cylinder wheel*, which has been made and brought into use as before mentioned, will be productive of the most valuable results on railways."

And on page 36 of said report, signed in these words: "All which is respectfully submitted, J. Knight, Chief Engineer.?"

And on page 12, of said Plaintiff's Exhibit No. 5, these words?

"During the time we have been engaged in this work many important improvements have been made, both in the construction of railroads and in the application of moving power upon them, by which an immense reduction in the cost of transportation, and increase of velocity, have been effected. Among these improvements may be noticed the facilities which the combined cylindrical and conical wheels, invented by the chief engineer of this company, afford in turning curves.

"By the aid of this highly valuable improvement, all doubt is removed of our being able to employ locomotive steam engines upon the Baltimore and Ohio Railroad."

And the said report signed in these words: "Signed by direction, and on behalf of the Board, Philip E. Thomas, President. Baltimore, October 11, 1830"?

State if the foregoing portions of the said reports of J. Knight, Chief Engineer, and Philip E. Thomas, President, are correctly quoted, as contained in said Plaintiff's Exhibit No. 5.

A. They are correctly quoted as here printed.

Thereupon adjourned, (to-morrow being Sunday,) until the 30th day of May, 1853, at 10 o'clock, A. M.

On this 30th day of May, 1853, at 10 o'clock, A. M., appeared before the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, Charles D. Gould, Esquire, Attorney for the Plaintiff, and the witness, Conduce Gatch, and thereupon I further proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

Q. No. 434. Will you now take the Plaintiff's book, which has been heretofore handed by his Attorney to you, and refer to the printed portion thereof, purporting to be "Fifth Annual Report of the President and Directors to the Stockholders of the Baltimore and Ohio Railroad Company—Baltimore, printed by William Woody, No. 6, South Calvert street, 1831," and turn to the alleged report of J. Knight, Chief Engineer, headed "Second Annual Report of the Chief Engineer of the Baltimore and Ohio Railroad—Engineers' Office, Baltimore and



Ohio Railroad, Baltimore, October 1st, 1831. To Philip E. Thomas, President of Baltimore and Ohio Railroad Company," and on page 19 find these words ?

"At first it was thought to be necessary to lessen the breadth of the track at the turnouts, in consequence of the great play which had been given to the flanges on all the other parts of the road, to wit, one and three quarter inches ; experience, however, has brought us to adopt the same breadth of track at the turnouts, as in other parts of the way, viz: four feet nine and a quarter inches between the iron rails, and an entire uniformity of breadth is now preserved throughout."

And on page 20, these words ?

"The cylindrical and conical form of the face of the wheel, remains as at first, excepting that the rise of the conical part has been changed from a ratio of one to six, to that of one to five, whilst the breadth of this part which was one inch, has been increased three sixteenths of an inch."

"The rise next to the flange is therefore now one quarter of an inch, instead of one sixth, as formerly."

"This change was induced from a conviction that the motion of the cars would, in general, be rendered steadier, and with considerable velocities, easier in the extreme curvatures. It was also believed that the effects of chilling would be greater, whilst the cone would be more durable ; at the same time, the experiments on friction justified the conclusion that no lateral thrust would result from this increase."

"Experience so far, appears to confirm all these expectations ; and it is believed that a decided improvement has thus been effected."

"The cone now used will answer for three feet wheels upon curvatures of road of 400 feet radius, and hence wheels of that diameter can be employed for the use of the locomotive engines."

"In the use of the Winans car, it was found that greater strength, and hardness of texture in the friction wheel, were requisite, than was at first apprehended. Greater strength to withstand shocks, and hardness to preserve from the attrition and wearing at the periphery bearing upon the end of the axle. It is believed that these defects have been remedied to a great extent, and so as to secure the practical success of this improved car. Improvements in the box containing the friction wheel and the oil, have also been effected."

And on page 21, these words ?

"From experiments which have been made on the Baltimore and Ohio Railroad, the traction with the use of the Winans car upon a level straight road, was found to be the one four hundred and fiftieth ; and making a reasonable allowance for unavoidable defects, it is believed that in practice, the traction will be the one four hundredth of the weight of the car and load. It was mentioned in the last report, that two kinds of cars were used upon this road, and that it was intended each should receive its utmost improvement."

"This subject has continued to claim attention, and will be pursued until a fair comparison can be made of the relative merits of each."

"The other car works with an outside bearing and chilled boxes, and is more simple and cheap in its structure. The traction with this car, according to the experiments, was the one two hundred and fifty-eighth, which allowing for defects, may probably be increased to the one two hundred and fortieth of the weight of the car and its full load."

And on page 22, these words ?

"In making these experiments, as well as in the arrangement of the machinery, I have been aided by my assistants, John Elgar and Ross Winans. The latter



gentleman is now engaged in planning the machinery and fixtures for the inclined planes."

And will you now turn to the "American Railroad Journal," published in New York, "Office 35 Wall Street, New York, May 19, 1832, Volume 1, No. 21," and find these words?

"American Railroad Journal, New York.

"May 19, 1832. — We cheerfully give place to the well written communication of Franklin, although it calls in question the correctness of opinions expressed by Mr. Knight, Chief Engineer of the Baltimore and Ohio Railroad, in his report of 1831. We have relied with great confidence, as we still do, upon Mr. Knight's experience in the business of railroad making; yet we are fully of the opinion that the system is comparatively in its *infancy*, and therefore we are desirous of receiving communications from scientific and practical men, which may lead to investigation, and we hope to improvements."

And turn to pages 323, 324 and 325, of the said number of the American Railroad Journal, and find these words, on page 323?

"For the American Railroad Journal.—Strictures upon the report of Chief Engineer Knight, Baltimore and Ohio Railroad, relative to the former dimensions, &c., of railway carriages, Anno Domini, 1831."

On page 324 and 325?

"Without making pretensions to superior sagacity, or claiming any thing remarkable in the way of *second-sight*, we cannot avoid predicting the same fate to Mr. Knight's cone and cylinder principle, that attended his\* first singularly un-mechanical attempts to cause the flange of the wheel to run upon the outside of the rail, and our wish is, that the loss of reputation and expense to the company, may be no greater, than it proved to be in that instance. It is indeed very surprising to us, that there should have been any hesitation as to which side of the rail the flange should run. The strength of the car and the greater security afforded by the particular direction in which the force of gravity would act in keeping up the contact between the flange and the rail, would so naturally suggest a preference for the inner side, that not to adopt it would argue a want of penetration equal almost to that of placing, as the saying is, 'the cart before the horse.'"

"Aside from the very obvious reason just mentioned, there are others which must undoubtedly have suggested themselves, in deciding upon the position of the flange upon those railways which were first constructed. The carriages upon them were formed with fixed axles, and hence the placing of the flange upon the inner side would tend not only to relieve the lynch pin from an unnecessary strain, but would be a security against the wheel running off from the axle, in case the lynch pin should be broken or lost out."

"There is another topic on which we should be pleased to remark relative to the method of reducing friction in railway carriages, as invented by Mr. Winans, adopted upon the Baltimore and Ohio road. We must, however, limit ourselves to a brief expression of our opinion that notwithstanding all that has been said and written upon the subject, by those who are supposed qualified to judge of its merits, the principle can never be advantageously applied to railways, unless there is some restraint placed upon the axles, other than what is recognised by the principle itself; and even admitting this restraint to be effectively imposed, there is, we

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\* "We perhaps do Mr. Knight injustice by this statement. If we mistake not there were other gentlemen associated with him at the time in the management of the Baltimore and Ohio Railroad."

have some reason to think, a better and more mechanical mode of reducing the resistance, with which the public will probably ere long be made acquainted."

"In conclusion, we must state that however unfortunate Mr. Knight may have been in his researches into the 'metaphysics' of mechanics, he has nevertheless evinced incomparably more talent, as well as more theoretical and practical acquirement than is to be found in these 'principles and expositions applicable in tracing the route for a railway,' with which the public were favored under a different administration of the engineering department of the company in whose service he is engaged."

"With respect to the report before us we think it not unfair or unreasonable to suppose that Mr. Knight's extreme partiality for his favorite principle of the cone has been not a little detrimental to his arriving at a more correct result in his investigations. Had he in the outset come to a correct conclusion as to what was requisite for the proper adaptation of the conic principle in relation to the diameter of wheels, etc., he would have been more excusable in doing violence to other circumstances, in his endeavors to discover a 'natural dependence' and 'general sympathy', as he terms it, between all parts."

"It is very true that the proper proportion and adjustment of the parts of a carriage to each other, and to the road, is of the utmost importance."

"In effecting this, however, the engineer must be cautious not to give an undue value to any one circumstance in preference to another. He must be careful likewise not to form analogies where none exist. It requires a practical mind to set a proper value upon all the influencing circumstances, and a mind likewise, that has a natural aptness or tact for such pursuits, to seize upon those which are most prominent and combine them with the most effect. The mathematics and theoretical mechanics are of great service in accomplishing this object; but, after all, they are but aids or tools, and although the most perfect of their kind, are of little value in unskilful and unpracticed hands. Indeed where there are not the over-ruling qualities of judgment, skill, and experience to guide, they are as likely to lead to an erroneous as a true result."

"We regard as highly as any one, the value of those sciences, and we have testified our attachment to them by the amount of time which we trust we have most profitably devoted to their acquisition, but we cannot concede that they are alone sufficient, and we should fail in our duty to the public, did we not caution them against placing too great confidence in deductions which come to them clothed in so imposing a garb."

"There is, we imagine, no better proof needed of the propriety of the above remarks, and of the total inadequacy of a merely abstract knowledge of the sciences, to render a man competent to judge and to direct in respect to the execution of plans or projects in the arts, than the simple and well known fact, *that nearly all of the great and important improvements in mechanics which have hitherto been made have been accomplished by men who have had no very large claims to scientific or literary acquirements.*"

FRANKLIN."

State if the foregoing portions of the report of J. Knight, chief engineer, and the editorial notice, and the strictures from the American Railroad Journal are correctly quoted.

[Objected to by Plaintiff's Attorney.]

A. They are correctly quoted.

Q. No. 435. Will you now turn to page 3d of said Plaintiff's book, in the alleged "First Annual Report of the Directors to the Stockholders of the Baltimore and Ohio Railroad Company," and find these words?

"The government of the United States, justly appreciating the importance of this enterprise, have extended to it a most liberal patronage. Several able and efficient

members of the *Topographical Corps*, have been detached to the service of the company. These officers have examined various routes from the City of Baltimore to the valley of the Potomac, and along that ravine as far as Cumberland. They are now engaged in a general reconnoissance of the country between the Potomac and Ohio rivers, and are expected to return in a few weeks, prepared to lay before the Board the result of their labors. Should a chief engineer by that time have been engaged, the Board entertain the hope, that they will soon after be ready to commence the actual location and construction of the road."

And the same report signed on the 4th page "By order of the Board, P. E. Thomas, President; Baltimore, 1st October, 1827"?

And on the next leaf following this, the words, "Report of the Engineers on the reconnoissance and surveys made in reference to the Baltimore and Ohio Railroad. Baltimore: printed by William Woody, No. 2 South Calvert Street, 1828"?

And on the next leaf, the words?

"Engineer Office of the Baltimore and Ohio Railroad, April 5th, 1828.  
"To the President and Directors of the Baltimore and Ohio Railroad Company.  
"Gentlemen—The undersigned have the honor to submit the following report on the reconnoissance of the country between Baltimore and the Ohio River, and also on the experimental surveys from Baltimore to Potomac, including the different routes indicated by the topography as most suitable to the contemplated railroad, the whole illustrated by the following maps and profiles."

And signed on the 86th page, "which is respectfully submitted by, Gentlemen, your obedient servants, Wm. Howard, U. S. Civil Engineer; S. H. Long, Top'l. Engineer, Bt. Lt. Col.; Wm. G. McNeill, Capt. U. S. T. Eng'r."?

And now turn to the printed publication "Narrative of the Proceedings of the Board of Engineers of the Baltimore and Ohio Railroad Company, from its organization to its dissolution, together with an exposition of facts illustrative of the conduct of sundry individuals. By Lt. Col. S. H. Long, and Capt. Wm. Gibbs McNeill, of the U. S. Topographical Engineers, and members of the late Board of Engineers. Baltimore: printed by Bailey and Francis, No. 173 Market Street, 1830;" with a preface "To the Stockholders of the Baltimore and Ohio Railroad Company." Signed, "Stephen H. Long, Wm. Gibbs McNeill."

And in "Part I. containing an Account of the Proceedings of the Board of Engineers, &c., from its organization to the 1st of October, 1829, and embracing a period of one year and three-quarters, by S. H. Long, President of the late Board of Engineers."

And on page 113, find the following words:

"December 24, 1828.

"Permission having been granted by the Legislature of Pennsylvania, at their last session, for conducting the railroad within the limits of that state, a resolution (see Appendix, Doc. U. 1) was this day passed by the Board, authorizing an examination of the country situated between the Potomac and Youghagany rivers, for the purpose of ascertaining the most feasible route for a railroad between these two streams, so far as this object might be effected without the aid of actual surveys. This service was confided to Lieut. Trimble, who was furnished with instructions for his guidance, by the President of the Board. (See Doc. U. 1, just cited.)

"About this time Winans's car made its first appearance in Baltimore, eliciting



the admiration and raising the enthusiasm of the most zealous friends of the railroad, to a pitch seldom equalled. This machine, whatever its merits might be in other respects, was admirably calculated to please the fancies of unskilful observers, and soon drew forth not merely the unqualified approbation of the President and Directors of the company, but the wildest ejaculations of astonishment at the wonders it would inevitably perform, and the surprising revolutions it would produce in the commercial world. The President of the company entertained not only the belief, but the sure conviction, founded upon the indisputable evidence of his own senses, that a horse could draw, on a car of this description, *thirty tons*, at any rate of speed at which he could travel—even to eight or ten miles per hour. In fine, its *powers* were such, in his estimation, that the effects of motive power, applied in this way, were absolutely incalculable. The right to appropriate the invention to the uses of the railroad company was offered for a thousand dollars, together with one dollar annually for each car employed on the road. The proposition having been made to the Board of Directors; to use the language of Mr. Thomas, '*it was carried by acclamation.*'"

"The Directors had already applied to Congress for a subscription on the part of the General Government to the stock of the company. The amount expected to be subscribed was a million of dollars. Every exertion was made, and every plausible means adopted to accomplish that object. The favorable impressions produced on the minds of some of the Directors by Winans's car led them to suppose that its exhibition at Washington would be attended with similar results on the minds of the members of Congress."

"The model car was accordingly despatched to Washington, succeeded by a deputation from the Directors, accompanied by the President of the Board of Engineers."

"A lucid statement of facts, exhibiting the comparative merits of railroads, canals, and other means of transportation; the principles involved in their construction compared with their relative efficiency; the economy of their use; their comparative durability; their adaptation to climates; their facilities of repairs and renovation, etc., etc., would have been far better calculated to illustrate the advantages derivable from railroads, than the display of a mere pigmy car, manœvered by silken threads."

"We would not be understood, however, as having the least intention to disparage the merits of the invention. On the contrary, we have ever regarded it as one of the best displays of *friction saving machinery* that we have ever seen; and we have no doubt that railroad cars, constructed in a manner to embrace its principles, would, on roads *perfectly horizontal*, be attended with an advantage of about thirty-three and one third per cent., over ordinary railroad carriages. The efficiency of the principles involved in its construction, independently of any allowance for the friction of rolling, as also that attendant on the impact of the shoulders and extremities of the axis, is deducible, as follows, viz. :—Let the diameter of the main carriage wheel be three feet, that of its axis three inches, that of the secondary or friction wheel nine inches, and that of its axis one inch; also, the friction of iron sliding on iron, with smooth surfaces, be regarded as equivalent to one sixth of the weight of the sliding body, then the amount of friction at the axis of the secondary wheel, compared with the entire weight or load in motion on a level road, will be expressed by the following compound fraction, viz. :— $1-9$  of  $3-36$  of  $1-6$ , equal to  $1-648$ , which expresses the relation of the friction to the load abstractly considered. To this may safely be added an equal quantity, on account of the friction at the shoulders and ends of the axles; of friction occasioned by rolling; of resistance occasioned by elasticity in the materials of which the rails and wheels are composed; of resistance occasioned by impacts of the flanges of the wheels against the rails; and of the ends or shoulders of the axles against the secondary wheels, making the aggregate resistance on these accounts equal to  $1-324$  of the load. Moreover, to



this amount may be added its 1-6 for inequalities on the surface of the rails, dust, gravel, etc. And we shall have, as the final result, showing the probable efficiency of Winans's car, 1-270 of the weight or load nearly; which implies that a stress or traction of one pound is sufficient to move two hundred and seventy pounds, or that three horses, operating with Winans's car, on a road *perfectly level*, will be able to perform the work of four, with ordinary cars. The resistance of which, from the causes above enumerated, is estimated at 1-200 of the load."

"With respect to the comparative prime cost of these two descriptions of cars, Winans's may be fairly estimated as costing at least fifty per cent. more than the other; and with respect to their comparative durability, the advantage may, with equal propriety, be estimated at sixty-six and two thirds per cent. in favor of the ordinary car."

"As an example of the efficiency of Winans's car, we refer to an experiment made on the railroad with a carriage of this description, constructed under the immediate direction of Messrs. A. Brown & Son, and employed in removing earth from the deep cut. It had travelled with a load through an aggregate distance not exceeding five hundred miles, and became unfit for further use. The ends of the main axes were worn into a hemispherical shape, and the interiors of the rims of the secondary wheels were much impaired. This, however, cannot be regarded as a conclusive test of the efficiency of the plan, for various reasons, which need not be enumerated at this time.

"We shall dismiss this subject with the following brief remark, that Col. Long would not admit that the invention possessed the extraordinary *advantages* and *powers* ascribed to it by Mr. Thomas and other directors, and that the weakness of his faith, in this respect, contributed probably more than any other circumstance to impair their confidence in his abilities and their respect for his judgment."

State if the foregoing paragraphs are correctly quoted from the said Defendant's book, and the said narrative by Col. Long and Capt. McNeill, as stated.

[Objected to by Plaintiff's Attorney.]

A. They are correct as here printed.

Q. No. 436. Look at the account of the action of two of the eight-wheel passenger cars, on a curved grade, on the Baltimore and Ohio R. R., and their descent down a precipice, with passengers, hereto annexed, and made a part of this question, as published in the New York Illustrated News, of April 16, 1853, as follows, to wit: marked "Defendant's Exhibit L," and say whether you knew any person or persons killed by the said cars; and whether the action of an eight-wheel car, improperly constructed, or with the wheels in each truck too close together, so as to have the trucks assume too great an obliquity to the outer rail of the curve, and catch and run over the outer rail or outer surface of the curve, as there shown, is liable to take place on a curved grade, such as shown and described in the Exhibit.

[Objected to by Plaintiff's Attorney.]

A. I knew a gentleman who lived in Baltimore, Mr. Daniel Holt, who was killed. I should suppose it would have that tendency.

Q. No. 437. Look at the number of the "*American Railroad Journal*, and Advocate of Internal Improvements, published weekly, at No. 35 Wall Street, New York, at three dollars per annum, payable in advance. D. K. Minor, Editor. Saturday, June 15, 1833. Vol. II. No. 24," and find the following words:

"James Wright vs. the Baltimore and Ohio Railroad Company. The trial of this interesting case has at length closed. The suit was brought for an alleged in-

vasion of a patent, obtained by the plaintiff, in September, 1829, for the discovery of a new principle in railway cars, whereby curves of any radius may be traversed with equal facility as straight roads. It was specified essentially as a combination of conical wheels with vibratory axles. It was proved that in July, 1839, *Ross Winans*, then in England, constructed a car with conical wheels and axles, to run in his patented friction wheel, an *incidental* property of which last named wheel is a vibration of the axle within the periphery thereof. That after experimenting with said car on the Liverpool and Manchester Railway, it was sent to the United States, where it arrived in the fall of 1829, and was used for several weeks on the Baltimore and Ohio Railway, when it was finally thrown aside, neither it nor any other car of the same construction being used thereafter. Though this car appears to have possessed the properties specified in the patent of the plaintiff, (a combination of cone with vibrating axle) it does not appear that the vibration of the axle was declared and maintained as a *principle* of the machine, in the view of the inventor or of the user.

"In May, 1830, the Baltimore and Ohio Railroad Company put upon their road a car, the invention of which they claimed for their chief engineer, as a new and important achievement. The car proving eminently successful, the company from that time constructed their cars on its plan. Hereupon the plaintiff brought his suit.

"After a laborious investigation of the case for twenty-five days, during which the learned counsel on both sides evinced great zeal, ingenuity and ability, the case was committed to the jury, who this day, at ten o'clock, rendered a sealed verdict, which being opened by the Court was found to be for plaintiff; damages \$21.00.

"This morning, on motion of the plaintiff's counsel, the Court entered judgment for \$63.00, being triple damages, according to the patent law. We understand the defendants have appealed on the case.—[Balt. paper."

And in Plaintiff's Exhibit No. 5, in the printed document "No. 1," Baltimore, February 1st, 1830. To Philip E. Thomas, President Baltimore and O. R. R. Co.," page 37, and signed "J Knight," on page 51, these words printed on page 41 and 42, to wit:

"After they had received the letters from Liverpool which gave the favorable cast to the use of the flanges on the inside, I was requested by Alexander and George Brown to examine the Winans car, in their warehouse, which had been sent over from Liverpool. From an inspection of the wheels it appeared that the conic principle had been carried to a much greater extent than usual. The face of the wheel, as it approaches near to the flange, being increased in diameter faster than usual, so as to make it difficult for the flange to come in contact with the rail; and this is, without doubt, the cause of the experiments at Liverpool with the Winans car proving favorable to the running of the flanges on the inside."

And in the Appendix to Part II. of the narrative of Col. Long and Capt. McNeill, published in 1830, and before referred to, on page 51, in speaking of the Winans car, a note in these words:

"\* An additional interest in this car should result from the confidence manifested by the Messrs. Brown in its success, whose enterprise and zeal have made them peculiarly interested in its prominence over other waggons, to an extent perhaps not less than as an inventor."

State if the foregoing quotations are correctly quoted from the publications, as stated, and if the suit of James Wright *vs.* the Baltimore and Ohio Railroad Company, mentioned in the American Railroad Journal, is the same suit referred to by you in your cross-examination.

[Objected to by Plaintiff's Attorney.]

A. The quotations are correctly quoted. The suit referred to in my cross-examination, is the same here mentioned.

Q. No. 438. Will you now look at Plaintiff's Exhibit No. 5, in the report for 1830, of J. Knight, chief engineer, and find these words, on pages 19 and 20, to wit?

"It having been found necessary to case-harden the rims of the cast iron wheels intended to run on railways, by casting them in iron chills, it will be indispensable to extend the chill over the conical as well as the cylindrical part, in order that that part may be as durable as the other. This has been done upon all the new wheels now in use on our road. Experience, however, has pointed to the use of some modification in the disposition of the volume of the metal composing the rim, (the form of the face remaining the same,) and also in the form of the *chill*, so as to attain the greatest perfection which shall be practicable. This subject is now under deliberation, and I have no doubt that with the aid of John Elgar, my assistant, and of Ross Winans, the inventor of the friction car, assisted by the skilful mechanics of Baltimore, that not only this matter, but others of equal utility, towards perfecting the moving parts, will be attained. The latter named person is now engaged in perfecting the practical application of his valuable invention."

And in Plaintiff's book, in the alleged report of J. Knight, Chief Engineer, dated October 1st, 1831, in speaking of experiments in the turn-outs with the Winans car, with the cone and cylinder wheels, with the chill box cars, and with the curved rails, to turn the corners of streets, these words, on page 22, viz?

"In making these experiments, as well as in the arrangement of the machinery, I have been aided by my assistants, John Elgar and Ross Winans. The latter gentleman is now engaged in planning the machinery and fixtures for the inclined planes."

And in Plaintiff's Exhibit No. 6, in the report of J. Knight, chief engineer, as there printed, dated Oct. 5, 1833, commencing on page 36, these words:

"The science, skill and genius of the engineers and mechanics in the service of the company, were therefore now directed to this point; and I am happy to be enabled to state in this communication that two successful methods of obtaining a good and perfect chilling, have been suggested and put into practice; the one method consists in applying to the inner periphery of the rim or the side of the spokes next to the flange and in the region of the conic part, *a second chill concentric with the first or exterior chill*. Now as the contracting metal immediately after casting, recedes from the exterior chill, it would press upon the interior one whilst the contact would cause the latter chill to absorb the heat that would otherwise have *annealed* the exterior periphery of the rim and destroyed the hardness already communicated from the exterior chill. The process in trial, justified the expectation, and a perfect chilling was attained precisely in that part of the rim where most needful. This manner of effecting the object, was first proposed by Ross Winans, assistant engineer of machinery. In the commencement, the failure of this process was threatened from a mechanical difficulty that may here be mentioned with the obviating expedient that proved effectual. So soon as the fluid metal should begin to cool, it would shrink and contract upon the interior chill of cold rigid iron, and with an intensity increasing rapidly with the abstraction of heat, at the same time that the malleability would diminish, and the consequence would be fracture. At first it was suggested to elevate, by means of a lever and appropriate connections, the chill from the rim of the wheel, as the latter should



contract, a slope upon the surface of the chill being given, to facilitate the operation. It was, however, thought to be difficult, if not impracticable, to execute this design for every wheel, and with proper and timely effect, and it was abandoned for the effectual method that immediately succeeded in the course of thought, and which bears the test of experiment. It is simply to give such a slope to the face of the chill, that it shall slide on the correspondingly sloped face of the casting, as the latter shall cool and contract."

"The other method of securing the efficacy of the chilling process, in a very effectual degree, was proposed by Phineas Davis, and consists in casting the rim so that the fluid metal shall surround and enclose within its body, a ring of cold malleable iron concentric with the wheel."

"The wheels now upon the Atlantic engine, have rings in them, and they work and wear satisfactorily; and it is confidently believed that this discovery will be of great advantage in locomotive wheels as well as in those of passenger coaches drawn by steam power at high velocities, and that a wheel made after this manner, might well be denominated the *safety wheel*."

"Since the time of the last annual report, a second locomotive engine, built by Phineas Davis, was placed upon the road. This machine differed from the Atlantic engine, in being lighter and in the substitution of the crank axle, in lieu of the spur and pinion wheels, the position of the cranks being inside of the road wheels. The engine was calculated for the slower speeds, and was intended to be employed in the conveyance of commodities."

"It is not thought proper, on the present occasion, to travel over grounds heretofore occupied in the Annual Reports, as regards the motive power and machinery, or to repeat what is said upon this subject, in my report upon the routes of the proposed railway to connect the cities of Baltimore and Washington, already referred to as a document annexed to this report; it may, however, be mentioned, that our confidence in the use of steel springs for the burden cars, as well as for the passenger coaches, remains unabated, and that this subject, in common with others of utility in railways and railway machinery, has continued to claim our especial care, and the result will probably be the fabrication and adoption of steel springs, entirely efficient, and very durable, the prime cost of which, inclusive of appurtenant fixtures, shall not exceed the one third part of that of *leather braces*, or even of the springs of steel as hitherto made and used to sustain equal stress elsewhere."

"The surveys, levellings, drawings and calculations, in relation to the routes for this railroad, have been conducted under my direction, by B. H. Latrobe, Assistant Engineer, whose services have been faithfully rendered, and continue to be highly valuable.

Respectfully submitted,

J. KNIGHT,

*"Chief Engineer, Baltimore and Ohio Railroad."*

And in the Plaintiff's book headed "[A.] Fifth Annual Report of the Chief Engineer of the Baltimore and Ohio Railroad: Engineer's Office, Baltimore and Ohio Railroad—Baltimore, Oct. 1st, 1834—to Philip E. Thomas, President of the Baltimore and Ohio Railroad Co." find the following words, commencing on page 19, viz. ?

"The field and office operations within the year having been adverted to, it may be added that, in their performance generally, I have been essentially and efficiently aided by Benjamin H. Latrobe, Principal Assistant Engineer, who was charged with the immediate command of the parties on duty, and by William P. Swann, Henry R. Hazellhurst, and James Murray, Assistant Engineers of much merit."

"Hitherto the successful combustion of anthracite coal in locomotive engines has been attained only upon the Baltimore and Ohio Railroad, in Cooper's tubular boiler, assisted by an artificial blast; and such a blast is made with the utmost economy, by



means of the fan wheel, driven by the directly applied power of the waste steam, or the steam after it has performed its office, as a prime mover within the cylinders. This manner of creating the blast is an invention of Phineas Davis, to whom a patent was issued."

"Whilst the size of the fire place and the external dimensions in the boiler in the Arabian differ immaterially from the corresponding parts of the Atlantic and Traveler engines, there has been a decided improvement in the external appearance generally, of the new engines, every part being now more tastefully formed and arranged. For these useful, and at the same time pleasing, yet not costly embellishments of the engines, as well as of the coaches, we are much indebted to the talents and refined taste of John H. B. Latrobe, Esq."

"Coaches for passengers have claimed the serious attention of the engineers and officers of this company within the past year; and it has been found, on trial, that a coach upon eight wheels is easier, and every way more comfortable to the passengers, cheaper in cost of construction and repairs, and less injurious to the railway, in proportion to the number of persons carried, the motion being more smooth and steady than those of four wheels. When eight wheels are employed, each end of the coach is supported by a frame having four wheels, the two pairs of which may be as near together as will permit the flanges of the wheels, two and two, to revolve, without being in contact with each other. In this way each set of four wheels will traverse a curved road easier than when the axles are further apart, as they necessarily must be in a coach with only four wheels. The coach has strong side frames of wood, plated with iron, and rests with bolsters upon the wheel frames, to which it is attached, by means of a *rose* or centre bolt, permitting each set of wheels to assume, independent of the other, any direction the road may require. These coaches may have apartments to contain from eight to twelve persons each, whilst the number of apartments in a coach may be three, four, or even five. Coaches with eight wheels will be safer from accident, it is believed, than with four wheels; in fact, they are much more convenient and appropriate, in all respects, for railway conveyance, and this kind of coach has, accordingly, been adopted."

"Steel springs are still being placed upon the burthen cars as well as upon the coaches, and with evident economy, in every respect."

"Wheels of cast-iron upon the cars of burthen, as well as upon the coaches, have stood the test of experience, and have come up to our most sanguine expectations. This description of road wheels has, in a word, been entirely successful. The method of completing the chilling process, by means of the introduction of a malleable iron ring into the casting, mentioned in the last annual report as invented by Phineas Davis, has been successful."

"Patterns for the cast-iron fastenings of the rails, and for the turn outs upon the lateral road, are in progress of completion, under the immediate care of the Assistant Engineer of Machinery, Ross Winans, with whose assistance these fixtures and the form of the rail have been matured."

"The turnouts will be such as are best calculated to facilitate the passing of locomotive engines."

"As regards the business of transit and of revenue within the year, upon the Baltimore and Ohio Railroad, I refer to the report, which will be made by the able and very vigilant Superintendent of transportation, William Woodville."

"Respectfully submitted,

"J. KNIGHT,

"Chief Engineer, Baltimore and Ohio Railroad."

State if the foregoing quotations from the Plaintiff's Exhibits and books are correctly quoted as stated?

[Objected to by Plaintiff's Attorney.]

A. They are correct.

560 DEPOSITION OF CONDUCE GATCH, FOR RESPONDENTS.

Thereupon adjourned until to-morrow morning, the 31st day of May, 1853, at 10 o'clock, A. M.

On the 31st day of May, 1853, at 10 o'clock, A. M., William W. Hubbell, Esq., Attorney for the Defendant; Charles D. Gould, Esq., Attorney for the Plaintiff; and the witness, Conduce Gatch, appeared before me, the Commissioner; and thereupon I further proceeded with the deposition of the said Conduce Gatch, as follows—to wit:

Q. No. 439. Look at the Plaintiff's book, page 108, and find the following words:

“[K.]

“OFFICE OF THE SUPERINTENDENT OF MACHINERY, }  
Sept. 29th, 1832. }

“To PHILIP E. THOMAS, *President of the Baltimore and Ohio Railroad Co.*

“In obedience to the rules and regulations for the government of the officers and agents of the Baltimore and Ohio Railroad Company, I now submit the following report of the department committed to my superintendence.

“Some improvement in the mode that had been used to keep the boxes properly oiled, was also found to be a very desirable object to effect. This has been attended with considerable difficulty. Several experiments were tried, the result of which were but partially successful. At length, the plan was adopted of inserting a ring on the end of the axle, which ring turns in a groove within the box; this by distributing the oil equally and in due quantity, was found to obviate all inconvenience, and appears completely to answer the purpose.

“Respectfully submitted, by

GEORGE GILLINGHAM,

“*Sup't of Machinery, B. & O. R. R.*”

And in Plaintiff's Exhibit No. 6, commencing at page 176, these words:

“[F.]

“OFFICE OF THE SUPERINTENDENT OF MACHINERY, }  
Oct. 1st, 1833. }

“To PHILIP E. THOMAS, *President of Baltimore and Ohio Railroad Co.*

“Experience has demonstrated that the use of springs on all the carriages, whether for the transportation of passengers or of merchandize, would contribute greatly to the preservation both of the cars and of the road. Such an arrangement would assist in regulating the motion, and serve, in some measure, to alleviate the sharp jar inseparable from the sudden and violent collision of two hard bodies and no mitigating medium, and thus save both the cars and the road from that racking concussion, which no perfection of construction nor any reasonable care and foresight to prevent every accident, can entirely obviate.

“The conveyance of baggage upon the tops of passenger cars has been attended with so much labor and inconvenience, in loading, unloading, and shifting the baggage, at so great a height, added to the manifest injury done to the cars in the hurry and bustle of these operations, that the necessity of some improvement on the present plan is obviously indispensable. It is proposed to construct some cars as tenders to the passenger trains for the exclusive purpose of carrying baggage; and in constructing them, to make two distinct apartments; one for the baggage going to the ultimate point of destination, which will remain undisturbed the whole trip; the other for the accommodation of way passengers.

“In the course of the year the following description of burden cars and coaches have been constructed, viz.:

55 house cars for merchandize,

61 box cars, for coal, lime, plaster, &c.  
 13 horse cars.  
 10 barrel cars.  
 4 large house cars, with berths, for workmen to lodge in.  
 3 tenders for engines.

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3 coaches, President, Patapsco, and Carroll.  
 There are in progress of construction,  
 1 car body, nearly finished.  
 3 do., to form one coach, on eight wheels, to carry sixty passengers.  
 1 do., to carry 24 passengers.  
 1 do., exclusively for baggage.  
 50 waggon frames, ready to be placed upon wheels.  
 On hand, 75,000 feet ash, and other lumber.  
 750 whole number of burthen cars on the road.  
 37 do., passenger cars.

---

787 total number of cars and carriages."

" Respectfully submitted,

"GEORGE GILLINGHAM,  
*"Superintendent of Machinery, B. & O. R. R.*

And in Plaintiff's book, commencing on page 29, these words :

" [B.]

" Office of the Superintendent of Machinery, Oct. 1st, 1834.

" To Philip E. Thomas, President of the Balt. and Ohio Railroad Co.

" In accordance with the rules and regulations for the government of the officers and agents of this company, I now respectfully submit the following report of the operations of the department of machinery, for the year ending on the first day of the present month."

Page 30 :

" In the year 1830, Peter Cooper, Esq., illustrated, by an experiment, with a small working locomotive engine, with a tubular boiler, the practicability of using anthracite coal as a fuel. Subsequently, Phineas Davis, in conjunction with the engineers and machinists of this company, has, by a series of experiments, introduced several essential improvements, resulting in a triumphant success, and in the construction of locomotive engines of great power, strength, and durability."

Page 32 :

" Four new passenger cars have been constructed during the present year, viz. :  
 1st, The Winchester, carrying 36 passengers, on eight wheels.  
 2nd, The Dromedary, a large and commodious car, eight wheels.  
 3rd, The Comet, a car with five bodies, carrying 40 passengers, eight wheels.  
 4th, The Patterson, on four wheels."

" Four of the old cars have been repaired, and placed upon eight wheels."

" All the other cars are in a respectable state of repair, and will probably do service through the ensuing winter, with but little additional expense."

" The number of burden cars now in the service of the Baltimore and Ohio Railroad Company, is 1,000, exclusive of 27 employed on the Washington road."

"The passenger cars hitherto in use on this road generally resembled, in many respects, the usual stage coaches. Most of them built within the present year are materially different from them in appearance and arrangement. The bodies are long, and supported on eight wheels, which are so placed as to pass the curvatures of the road with greater facility than the ordinary kind of car. These are not only more commodious, but they afford additional security to the passengers; they are simple in construction, and very strong, and, consequently, will seldom require any repairs, by which a great saving will be effected.

"During the time these carriages have been in use several further improvements have been suggested, and the plan is now adopted which, it is thought, when introduced, will be very safe and commodious, and meet the public approbation.

"Respectfully submitted,

"GEORGE GILLINGHAM,  
*"Superintendent of Machinery, B. & O. R. R."*

State if the foregoing quotations from the Plaintiff's Exhibits and books are correctly quoted as stated.

[Objected to by Plaintiff's Attorney.]

A. They are correctly quoted.

Q. No. 440. Did you observe that the alleged assertion of Philip E. Thomas, quoted by Plaintiff's Attorney, to wit:

"After the experience of several years, the Board have come to the determination of employing an eight-wheel car, invented by Ross Winans, for the transportation of passengers. This consists of two sets of ordinary running gear, with steel springs,"

etc., as further quoted by Plaintiff's attorney, is under the date of October the 6th, 1834, and being five days after the issue of Ross Winans's patent, of October 1st, 1834, for "improvements in cars or carriages intended to run upon railroads," and about five months after you left the employ of the company—and that the alleged reports of Jonathan Knight, Chief Engineer, and George Gillingham, Superintendent of Machinery, referred to by Mr. Thomas, for further particulars, as quoted by Plaintiff's Attorney, both of them bear date the 1st October, 1834, the same day on which said Ross Winans's Patent was issued to him, and particularly describe and mention the eight-wheel car, and do not state or pretend to assert that Ross Winans had any connection with the suggestion or invention of the same? State if you observed the same.

[Objected to by Plaintiff's Attorney.]

A. I did.

Q. No. 441. Did you observe in the said alleged reports of John Elgar, George Gillingham, and Jonathan Knight, Chief Engineer, quoted by the Plaintiff's Attorney, that although they speak of your inventions, to wit:—the ring, on the end of the axle, to oil it—the eight-wheel car, and the application of springs to the cars, in the manner adopted, they alike omit to state who invented them, or either of them—yet when they speak of different inventions, made by themselves, to wit, by the said Engineer and his assistants, they particularly mention the names of said Engineer and his assistants, as the case may be, as the inventors or suggestors of such different inventions? State if you observed the same.

A. I did.

Q. No. 442. Is there anything contained in the pay-rolls produced



by Plaintiff's Attorney, or in the quotations from alleged reports, by Plaintiff's Attorney, that contradicts your testimony as to the invention and construction, and the use of the eight-wheel timber cars, and the eight-wheel wood cars, and the eight-wheel horse car, on the same principle, in 1830, and of the car Columbus, in 1831, or any of the facts as stated by you in evidence?

[Objected to by Plaintiff's Attorney.]

A. None, to my knowledge.

[Recess, until 4 o'clock, P. M.]

Q. No. 443. Look at Plaintiff's Exhibit No. 7, page 10, and find the following words in the report of the President, J. W. Patterson, as there printed, for the year ending 10th October, 1836, viz :

"Since the death of Phineas Davis, mentioned in the last annual report, Messrs. Gillingham and Winans have taken the company's shops at the Mount Clare depot, and continue there the manufacture of locomotive engines and railroad machinery, commenced by Mr. Davis."

Signed, "By order of the Board, J. W. Patterson, President."

State if the same is correctly quoted, and also state if Ross Winans is still engaged at Mount Clare, in the business of manufacturing locomotive engines, and the tenders that belong to them.

A. The quotations are correct. No, sir, he is not there now; the Mount Clare Depot belongs to the Company, and Winans's shops belong to himself. They are adjacent to the Mount Clare Depot. He is engaged in that business.

Q. No. 444. Will you now turn to "Plaintiff's Exhibit No. 5," page 69, and find the following words?

"[No. 4.]

"BALTIMORE, Feb. 10, 1830.

"To PHILIP E. THOMAS, *President Baltimore and Ohio Railroad Company.*

"In answer to a resolution of the Board of Directors of the 8th instant, calling for information as to the plan and probable expense of constructing a single track of railway, from Baltimore to Ellicott's Mills, the following observations, calculations, and statements, occur to me as the best I can now give. I have no reason to think that the statements of lumber are inaccurate, and the calculations are as good as I can give, in the absence of more experience. They will be received as approximations; perhaps near the truth.

"It will be necessary, for economy, to continue the plan of using wooden sleepers to the valley or ravine of the Patapsco, at least; then, on account of the proximity of stone, suitable for blocks, the plan of laying the rails upon these, instead of upon the sleepers, may be tested so far as to determine the propriety of continuing it or not. The greater part of the portions of railroad already laid, has been done under circumstances which I deem too peculiar to justify me in drawing a conclusion from thence, as to what the residue will cost."

And on page 74, of the same document?

"*Materials.*

"*Sleepers.*—According to a return before me, there has been contracted, to be furnished, 8,000 sleepers, which will be fulfilled when those are furnished which Dennis A. Smith was to prepare. Presuming that this will be done, there will be enough for about six miles of single track, or four and a half beyond the city division. I would recommend the purchase of 4,000 additional, about half of which will be wanted for the city division, and can be procured now in this city, according to a report of John Ready to me."

## 564 DEPOSITION OF CONDUCE GATCH, FOR RESPONDENTS.

*"Scantling for the Strings.*—There was received, prior to the first of the present year, as per list made out by Capt. McNeill, from the inspector's returns, in superficial feet, . . . . . 219,426  
 There has been received, since that time, . . . . . 65,816  
 Total, . . . . . 100,000  
 There has probably been used, . . . . . 100,000

Remaining on hand, and sufficient for 5 1-2 miles single track, . . . 185,242

"Supposing the single track to be continued to the mills, independent of what is now laid, provision must be made for 7 1-2 miles more, which will require 250,000 feet additional, which I recommend to be contracted for without delay.

"We had due, on the 31st ult., from J. Sullivan, 200 M. feet. It is believed he has been prevented the delivery by the rigor of the season. It would be unsafe, however, to depend on a single contract for this quantity, especially as it would not be amiss to have double the quantity. Respectfully submitted,

J. KNIGHT."

And on page 74 of the same Exhibit, these words?

"[No. 6.]

*"Information in relation to the Baltimore and Ohio Railroad, to enable persons wishing to become contractors for laying the rails, to make their proposals.*

"The wood work will consist of cedar, locust, mulberry, or oak sleepers, each from seven to eight feet in length, and from five to ten inches in thickness, more or less; round, square, or angular, which the contractor will lay, or cause to be laid, transversely of the road, at distances from each other of four feet, from centre to centre."

"Of yellow pine scantling string pieces, each from 12 to 40 feet in length, and 6 inches square, more or less."

And on page 79 of the same document, the words?

"The sleepers in the rough, of the dimensions stated, as nearly as may be—the string pieces, as they come from the saw mill, and the iron rails prepared ready for laying, will be delivered at the charge of the company upon the road on some point within the limits of the contract."

And on page 85 of the same exhibit, these words?

"[No. 8.]

ENGINEERS' OFFICE BALTIMORE AND OHIO RAILROAD, }  
 BALTIMORE, September 30, 1830. }

"To JONATHAN KNIGHT, Chief Engineer.

"In pursuance of my appointment, on the first of March, as assistant engineer, in the service of the Baltimore and Ohio Railroad Company, to superintend the laying down of the rails on the city and first division of the railroad, to manage and direct the materials, and to perform such other services as might be required, and were necessary to a vigorous prosecution of the work in question, I have attended, as far as practicable, to the several duties required, and herewith submit a summary of the proceedings connected therewith, accompanied by a statement, in detail, of the cost of the said work, on the several sections respectively; from the city division to the end of the twelfth section, inclusive, and for the remaining sections collectively, to the end of the 26th, inclusive of the first division."

And on pages 86 and 87 of the same report, these words?

"On the first day of May, or within about six weeks from the commencement of the work, a length of track nearly equal to fourteen miles, was completed. On

the 13th of that month, a car was passed through the entire line, from Baltimore to Ellicott's Mills, and on the 22d of May, the road was opened for travel, by which time about three miles of the second track was also completed."

"After the commencement of the laying of rails, about 500 thousand feet of 6x6 yellow pine scantling was received on different contracts, with the expectation of its being wanted for the completion of the second track of rails on the first division; but in consequence of the substitution of stone sills on that part of the first division lying within the valley of the Patapasco, from 250 to 300 thousand feet of this scantling remains on hand, the principle part of which is piled at the depot on Pratt street.

"A few sleepers, several kegs of nails, and a portion of plates and screw bolts are also left unused. There also remains for further disposition, four or five thousand cast iron knees, such as were used for the stone blocks, which with the rail timber just mentioned, and procured for the same purpose, may hereafter be found available in the construction of some portions of the railway. These knees are principally lodged at the Avalon Copper Warehouse."

And signed on page 97,—“Respectfully, James P. Stabler, Assistant Engineer”?

State if the foregoing quotations from the said Plaintiff's Exhibit No. 5, are correct, as stated, and if the depot there referred to, on September 30, 1830, as on Pratt Street, is the same, called the Mount Clare Depot, and if the six by six yellow pine scantling there referred to, are the same kind from which those used to construct the body or frame of the eight-wheel wood cars built by you, in the fall and winter of 1830, as you have testified, were obtained.

[Objected to by Plaintiff's Attorney.]

A. Yes, sir, the quotations are correct. The depot is the same, I presume; there was no other at that time; scantling of that size was frequently used for the cars.

Q. No. 445. Now look on page 75 of the Plaintiff's book, at the report of James P. Stabler, and find these words:

“[J.]

“Office of Construction, Baltimore and Ohio Railroad, September 30, 1832.

“To Philip E. Thomas, President Baltimore and Ohio Railroad Company.”

“The following report of the operations of the department of construction, for the past year, is respectfully submitted.”

“The fifth annual report to the stockholders, having been made during the unfinished state of a large portion of the work then under contract, and at a time when from other causes, it was impracticable to enter as fully into a detail of the transactions of this department, as might have been desirable, only so much of these operations were embraced in that report, as was necessary to show the general progress of the work up to that period. As, however, the work of construction intended to be completed during the present season, is now finished, and the facts and results to be derived from the portions actually constructed during the year, are in some measure dependent upon and connected with the parts executed prior to that time, it will be necessary, in order to attain the knowledge of these results, to review some of the transactions relative to laying the rails from the commencement of the work.”

Page 78:

“But some materials procured for specific purposes in the construction of the railway, it has been found convenient and necessary to apply to other parts of the

## 566 DEPOSITION OF CONDUCE GATCH, FOR RESPONDENTS.

work. Scantling procured for the railway has been used for building, for bridges, for various parts of the machinery connected with the road, and for a variety of other purposes."

Page 79:

"The whole amount of disbursements on account of the construction and repairs of the railway, together with incidental expenditures on account of graduation, masonry and other items, not properly chargeable to the railway, but necessarily made by the department having in charge the laying of the rails, has been as follows: "

1. For 6x6 inch yellow pine and other scantling, and log stuff for string pieces, inclusive of the services of agents in procuring it, inspection, piling, handling, wharfage, ground rent for places of deposit, hauling to places of deposit in Baltimore, and elsewhere, loading and contingencies not classed as above, \$91,379,69
- " 2. For sleepers of every description, including the same kind of charges made upon the scantling, . . . . . \$34,545,89"

Page 82:

"As has been observed, it will be improper to state as the cost of the rail tracks finished, the whole of the above amount, or even all of those charges for *materials* which are applicable to the railway, because there are portions yet unappropriated to that use, and some which have been applied to other purposes. [See appendix J, statement No. 2.] It will therefore be necessary to separate from the foregoing charges for materials, such proportion of the several kinds, as have been actually applied to the work now finished, in order to show the true cost of the railway. The scantling purchased, was 1,305,913 feet, running measure, at an average cost of \$69,97-100 per thousand feet, or say seven cents per foot run."

"The length of track laid with scantling, 95,38-100 miles, and would require 1,007,213 feet net measure. Add for turnouts, keys, crossings for county roads, and waste, 940 feet per mile, say 89,657 feet, and the amount charged to railway, will be,

Remaining on hand at depot, Pratt street, . . . . .	1,096,870 feet.
On 3d, 4th and 5th divisions and lateral road, . . . . .	82,783
	62,000

Making together, . . . . .	1,241,653 feet.
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"Leaving 64,260 feet appropriated to other purposes, as before mentioned."

And in the Appendix J., Statement No. 2.

"64,260 feet scantling used for other purposes than the railway, 4,498,20."

And the said report concluding in these words:

"I feel bound also to acknowledge the important aid derived from John Elgar, engineer of machinery, who has been engaged in superintending the construction of the turn-outs, from the commencement of the work until July last. The superiority of his improved turn out, (a drawing of which was given in the last annual report) over any other as yet in use, and his indefatigable exertions in bringing to its present perfection this important improvement in the machinery of the Baltimore and Ohio Railroad, deserves the highest commendation.

"Respectfully, JAMES P. STABLER."

State if the foregoing quotations from the Plaintiff's book are correct as stated.

A. They are correctly stated.

Thereupon adjourned until tomorrow morning, the 1st day of June, 1853, at 10 o'clock, A. M.



On this 1st day of June, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, Charles D. Gould, Esquire, Attorney for the Plaintiff, and the witness, Conduce Gatch; and thereupon I further proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

Q. No. 446. Will you now look at Plaintiff's book, and find the following words, commencing on page 42, viz.?

"[No. 1.]

"OFFICE OF CONSTRUCTION, B. AND O. R. R. }  
Baltimore, July 31st, 1831. }

"To the President and Directors of the Baltimore and Ohio Railroad Company.

"In pursuance of a resolution of your Board, the Superintendent of Construction proceeds to lay before you "a full narration of the facts and circumstances which led to and have attended the late disorders upon the 3d division of that road, in order that the Board may ascertain the real cause thereof, and as far as possible provide against the recurrence of such disorders."

And after a narration of facts, on page 43, these words?

"Things were in this situation about the 20th of June, when most unexpectedly information was received that the workmen of Lyon had struck, or ceased to work; that Lyon was in their debt to a considerable amount, and that they had threatened immediate destruction to the work unless they were paid, and that Lyon himself was absent from the division."

And on page 44?

"On the 21st June, Mr. Stabler proceeded to the 3d division, and collected all the accounts, and ordered and saw executed an accurate estimate of the work."

And on the following page?

"On the same day, Mr. Stabler, together with Mr. Sherwin, the newly appointed resident engineer, started for Sykes's, on the 3d division, and on Wednesday, the 29th, offered to pay to the men who collected there, their respective dividends of the above sum, amounting to twenty cents on the dollar."

Page 45?

"To their demand for full payment, Mr. Stabler could only answer, that he came there for a specific purpose, to distribute a certain sum, and if they declined taking it, he must return to Baltimore for further orders. Seeing that nothing could be obtained from Mr. Stabler, the workmen marched directly to the road, armed with their usual tools, and commenced destroying the sills, and tearing up the culverts, in the neighborhood of Sykes's. After a short time, however, they were induced to cease, and agreed to wait until ten o'clock the next day, in the hope that what they had already done would bring the Board to terms with them, determining, if it failed, to continue to commit acts of violence, until they succeeded in obtaining full payment. Mr. Stabler came express to Baltimore, where he arrived at 2 o'clock, on the 29th, and calling at once upon the counsel of the company, a warrant was obtained from Judge Hanson, requiring the Sheriff to arrest the persons named in it, and all others whom he might find engaged in the riot. This was put in the Sheriff's hands at three o'clock, with directions that he should at once proceed to the spot, summoning as he went the *posse comitatus*, and endeavor to keep the peace, and support the laws. The Sheriff reached the third division on the next morning, Thursday, in company with Mr. Patterson, the only person of the *posse* who attended to his summons at that time. They had not pro-

ceeded far down the road, when they were met by the workmen, to the number of 135, marching with their stone hammers and other tools,, with a handkerchief on a pole for a flag, under the command of one of their number, named Hugh Reily, to whom they appeared to pay implicit obedience. One of them seized the reins of the Sheriff's horse, and refused to let him proceed, and *all* were totally regardless of his authority and injunctions. Finding that he was powerless to protect the laws, he returned to Sykes's, and dispatched an express to Baltimore, stating the inefficiency of the civil authority without the assistance of a strong armed force."

"The conjuncture had now arrived, when for the first time it became legal to call for military aid, and within an hour after the express reached town, Judge Brice had granted the necessary warrant to Brigadier General Stewart, and by ten o'clock, on Thursday night, upwards of one hundred of the volunteer troops of this city fully equipped and officered, were despatched in cars to the aid of the Sheriff. They reached the third division soon after day-light, found the rioters wholly unprepared, made prisoners of near fifty of them, among whom was Reily; left a company at Sykes's, to secure order, and returned to Baltimore in the afternoon of Friday; having successfully accomplished the object of their expedition without contest of any kind, or the slightest accident."

"A company remained at Sykes's, and returned on Saturday, with eighteen prisoners more; reported the riot to be entirely quelled, and the rioters who were not taken entirely dispersed."

Signed on page 47 — "Respectfully submitted. Jacob Small, Supt. of Const."?

State if the foregoing quotations from Plaintiff's book are correct, as stated.

[Objected to by Plaintiff's Attorney.]

A. The quotations are correct, as here stated.

Q. No. 447. When the railroad was constructed or extended from Baltimore to Ellicott's Mills, did it pass through or near forests or woods, and was cord wood made available by it for the Baltimore market?

A. A large portion of it passed through woods, and it was made available to bring the wood to market.

Thereupon adjourned until tomorrow morning, the 2d day of June, 1853, at 10 o'clock, A. M.

On this 2d day of June, 1853, at 10 o'clock, A. M., appeared before me, William W. Hubbell, Esquire, Attorney for the Defendant, and Charles D. Gould, Esquire, Attorney for the Plaintiff, and the witness, Conduce Gatch, and thereupon I further proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

Q. No. 448. Turn to the Plaintiff's book, and find the following words:

"*First Annual Report of the Superintendent of Transportation.*

"OFFICE OF TRANSPORTATION, BALTIMORE AND OHIO RAILROAD, }  
"October 1st, 1831. }

"PHILIP E. THOMAS, Esq., President.

"Sir,—Having, in addition to my duty as auditor, been appointed Superintendent of Transportation on the railroad, I respectfully submit to you the accompanying documents, as the result of the operations in that department, from the 1st January to the 30th September, of this year."

"The limited extent of railway hitherto in operation, and the trouble, expense, and delay attendant upon a removal at the depot, to other vehicles, of the commodi-

ties transported upon it, have tended to retard a full adoption of its facilities for the general purposes of trade; the use of it has, consequently, been almost exclusively confined to articles either produced or to be used on its immediate line; and, although the tonnage now conveyed on the road amounts to upwards of 1,100 tons per month, it may be considered as a commerce created entirely by the cheapness of this system of communication; in commodities, too, which, without its facilities and economy, would have remained totally unavailable to the public."

"This result is the more gratifying, as it is an evidence of the extent and value of the addition which will hereafter be made to the ordinary and established tonnage of the country from resources which are now only beginning to develop themselves.

"Respectfully submitted,

"W. WOODVILLE,

"Auditor and Super. of Transpt."

And in Plaintiff's book, page 114, these words:

"[M.]

"OFFICE OF TRANSPORTATION, BALTIMORE AND OHIO RAILROAD COMPANY, }

"1st October, 1832" }

"PHILIP E. THOMAS, ESQ., PRESIDENT.

"Sir,—The period having arrived when it becomes necessary to report to you the transactions connected with the transportation on this road for the past year, the accompanying documents, marked from M, No. 1, to M, No. 7, exhibiting in detail all the operations in that department, to the 1st October, are respectfully submitted to you."

"The statements M, No. 5 and 6, exhibit the apportionment of the expenditures to the particular branch of revenue to which they respectively belong, as well as the subsequent net profits of such branch; to this document are also appended the amounts disbursed, respectively, for the repairs of the road, and of carriages and machinery, by the officers at the head of the departments to which those duties belong; and further, in the table M, No. 7, is presented a monthly detail of the various commodities, and of the aggregate tonnage of each respectively transported eastwardly on this road during the past year."

"By reference to these papers it will be found that the cost of transportation has, for some months past, been materially reduced, whilst the commerce and general efficiency of the road has been increased; the immediate cause of the high rate of expenses, for some time after the road was extended to Frederick, have already been made known; the most prominent of these was the withdrawal of the moving power of the company from their ordinary traffic to the transportation of fuel for the supply of this city, at a time of an unprecedented scarcity of that commodity."

And in said table M, No. 7, these words and figures, amongst other commodities:

	Tons.	Cwts.	Qrs.	Lbs.
"Firewood, . . . . .	4,480	11	0	27

And the said report signed, "Respectfully submitted, W. Woodville, Auditor and Superintendent of Transportation, Balt. & Ohio R. R. Co."

State if the foregoing quotations from Plaintiff's book are correct as stated.

[Objected to by Plaintiff's Attorney.]

A. They are correct as stated in the printed report.

[Recess until 4 o'clock, P. M.]

Q. No. 449. About what number of four-wheel trucks, such as were used for constructing the eight-wheel wood cars, like model E, were



there in use upon the road in the fall months of the year 1830, and were they numbered or not, at that time?

[Objected to by Plaintiff's Attorney.]

A. I think there must have been near a hundred; it was the custom to number them. The first that were made were not numbered, and I do not know what time of the year we commenced numbering; the cars used on the road were numbered as we could get hold of them, in repairing them, from time to time.

Q. No. 450. Was the weighing of the green cord wood, which you spoke of in your cross-examination, done sometime after some of the eight-wheel wood cars had been in operation?

[Objected to by Plaintiff's Attorney.]

A. I cannot say positively, but as far as my memory serves me, it was after some of them were put in operation, in the fall of 1830.

Q. No. 451. Was the body framing of the eight-wheel wood cars, made of scantling or string pieces, as you have described, planed or painted; and where was it put together, and fitted on the four-wheel trucks; where did the trucks stand at the time?

[Objected to by Plaintiff's Attorney.]

A. They were generally put together rough, firmly bolted; there was no planing or painting about them. Such work was generally done out of the shop, outside. The trucks stood at the most convenient places to the shop. We had a temporary siding or track, in front of the shops, on which such work was generally done.

Q. No. 452. Will you read the names of the persons who worked at the shops under your direction, from the pay-roll for November, 1830, heretofore handed to you by the Plaintiff's Attorney?

A. M. Glenn, J. Rupp, F. A. Gatch, W. O. Frost, E. Eichelberger, J. Eichelberger, O. Cromwell, P. Fullerton, L. Forrest, C. Parraway, Dugan & Robb, H. Reynolds.

Q. No. 453. Will you state what kind of work the entries on the pay-rolls for November and December, 1830, and January, February and March, 1831, heretofore handed to you by the Plaintiff's Attorney, refer to, or where it was done, and state why the fitting of the body framing of the eight-wheel wood cars, together, and on the trucks, was not stated or mentioned on said pay-rolls?

A. Those reports have reference to new work done in the shop principally. What of repairs and rough work that was done out of the shops, was not generally reported. The principal reason why the wood cars are not named, I suppose, and were not done in the shops, was that the timber was long and unhandy, and it required but little time to prepare the cars.

Q. No. 454. Look at the strip which *I have now placed on the model E*, connecting the two trucks, and marked "Model E, Safety Strip," and say if that truly represents the strip of board, such as the men on the road used to connect the trucks of the wood cars, and say whether the strip of board they used interfered with the free action of the trucks, to suit the curves and inequalities of the road.

A. As far as the actual use of the strip is concerned, that is a fair representation of those used; but they were not confined to length, width, or thickness. I don't suppose they materially retarded the movement of the cars through curves and switches.



*Q. No. 455.* Could those strips be lifted off and put on with the hand, when desired?

*A.* They could.

*Q. No. 456.* Was the car Columbus in use upon the road, from the time she was built until you left, in April or May, 1834? and state how long, to your knowledge, she was used on the road, as occasion required.

[Objected to by Plaintiff's Attorney.]

*A.* She was used whenever occasion required, until I left, or when she was undergoing repairs. I cannot tell how long she was used after I left; I suppose a year or two.

*Q. No. 457.* Do you mean to say she was used except when she was undergoing repairs?

*A.* The former answer is perfectly plain. Occasion might have required the car when she was undergoing repairs; then she could not be used. She was no time out of service, only when she was repairing.

Thereupon adjourned until to-morrow morning, the 3d day of June, 1853, at 10 o'clock, A. M.

On this 3d day of June, 1853, at 10 o'clock, A. M., appeared before me, William W. Hubbell, Esquire, Attorney of the Defendant, and Charles D. Gould, Esquire, Attorney of the Plaintiff, and the witness, Conduce Gatch; and thereupon I further proceeded with the deposition of the said Conduce Gatch, as follows, to wit:

*Q. No. 458.* When the drawing A B, marked in this case Plaintiff's Exhibit No. 4, and the smoked drawing, said to be the original of this copy, were before you, in the examination referred to before John Carriere, Esquire, had you a full opportunity, and abundant time given you to examine its parts, proportions, and peculiarities of finish and construction, and also to measure and calculate the same? State particularly.

*A.* I had not time, and did not examine particularly, its proportions. I don't know that I measured anything about it. It was shown to me in that case, as the original drawing.

*Q. No. 459.* Does it represent the Columbus as she was first built, in any other precise particular than in the colors which the body and doors are painted, and in the general feature of a car with four wheels on a side, or of an eight-wheel car. Examine it closely and particularly.

*A.* It does not represent the Columbus by the finish on the top at all; there was no such finish on the Columbus when first built. It does not represent the Columbus in placing two doors on one side. It does not represent the Columbus in the manner of construction, as the uprights, in the drawing, pass up through the roof of the car, to support a wooden frame on top; the top rail of the body of the car, shows a rail halved into the uprights, from the outside, or let into the uprights from the outside. The uprights are further apart, considerably, than the Columbus was built. Without the top finish and the running gears, it is a partial representation of the Columbus, when first built.

*Q. No. 460.* Examine the model car before you, marked "Defendant's Exhibit K," and say what car it represents, what car it is a true representation of, and at what time, or when.

[Objected to by Plaintiff's Attorney.]

A. The model K represents the car Columbus when first turned out on the road for use, July, 1831.

Q. No. 461. Will you take the Plaintiff's drawing, Exhibit No. 4, and carefully examine the ground plan of the bottom framing on it, and say whether it has the same number of pieces arranged in the same way that the bottom framing of the Columbus had when first built? and if not, state the difference.

[Objected to by Plaintiff's Attorney.]

A. It has not the same number of pieces in the frame. There were two intermediate pieces running lengthwise, dividing the bottom into three equal parts, on which the floor was fastened in the frame-work of the Columbus.

Q. No. 462. Has this ground plan in "Plaintiff's Exhibit No. 4," any piece or pieces running lengthwise between the side pieces, to support the floor; and does this plan at one end show that the floor boards are extending crosswise, and not lengthwise?

A. This ground plan does not show any frame-work running lengthwise, and represents the floor, or a portion of the floor, running crosswise of the frame.

Q. No. 463. Do you mean that it does not show any frame-work running lengthwise between the side pieces?

A. That was what I intended to say.

Q. No. 464. Will you look at the said ground plan on Plaintiff's Exhibit No. 4, and say what the two cross pieces on it, with two concentric segments of circles to each set of cross pieces, represent in mechanics?

[Objected to by Plaintiff's Attorney.]

A. If this is a top view of the bottom framing, the piece that runs across will represent the top framing of the car of the running gear, as the ring is shown on top of that piece. It is impossible for me to determine here what is intended to be represented by those two pieces, as it would require a man to be under the car, and look up at it, to put it in the position it is here.

Q. No. 465. Supposing a man was underneath, and looking up at it, or the said ground plan, what does the ring shown there indicate in its position as shown to each set of the cross pieces? and look also at the side elevation view, and say if it shows plain bolsters, and then measure the shortest of the cross pieces in the ground plan, and say what it would be in length, at a scale of three-quarters of an inch to the foot, and whether it would be long enough to go either across the body of the car, or across the truck frame shown in side view on the elevation.

[Objected to by Plaintiff's Attorney.]

A. If this wide piece that extends across is intended to be the piece immediately connected with the body, it indicates the ring above the bolster, and on the side elevation view no rings are represented at all. The running gears represent a plain cross piece of the corresponding width of the widest piece represented on the ground plan; the short piece at a scale of three-quarters of an inch to the foot, shows a piece about four feet nine inches long, too short to go across the body or running gears either.

*Q. No. 466.* What do the two segments of the ring each side of the short cross piece on the ground plan show or indicate, as to the position of the ring, relatively to the short and the long cross pieces, and as to their motion or action relatively to each other?

[Objected to by Plaintiff's Attorney.]

*A.* It is impossible for me to tell, unless I knew what the pieces represented. If the longer and wider piece represents the middle cross piece of the truck, the other represents the bolster, the swivelling bolster. Then there is no cross timber represented, if that be the case, to fasten the circular piece to, and support the car on, that rests on the thorough brace.

*Q. No. 467.* Is there any truck shown on the ground plan part of the Exhibit?

*A.* None, if I understand the drawing.

*Q. No. 468.* Is there any thorough brace bolster and ring connected with it shown on the elevation part of the Exhibit, where the trucks are shown as connected with the body, or are they shown as plain bolsters connecting the trucks to the body?

[Objected to by Plaintiff's Attorney.]

*A.* It simply represents here a plain bolster or bolsters fastened to the bottom sides of the body; the two lines, one on the end of the main cross piece of the truck, and the other on the bolster, indicate the taper from the centre out to the end, and shows the distance they are apart at the end.

*Q. No. 469.* Do the rings showing only segments in the ground plan, and not showing the entire ring across the short cross pieces, as in the model K, together with the connection in the elevation of the Plaintiff's Exhibit No. 4, between the trucks and body, being with plain bolsters, indicate or show that those short cross pieces on the ground plan are not thorough brace bolsters?

[Objected to by Plaintiff's Attorney.]

*A.* The ring on the ground plan is represented between the two pieces of timber. If the plain bolster represented under the body, in the elevation view, is nothing but a plain bolster, then there is no thorough brace bolster represented there at all, in the elevation view.

*Q. No. 470.* If those short pieces on the ground plan in Plaintiff's Exhibit No. 4, were intended to be thorough brace bolsters connected to the cross pieces or bolsters of the body framing, shown in the ground plan, would not those rings have had to be shown in the full circle extending across the short bolster, as in an underneath view of the framing of model K, and not in segments passing between the two, as shown in the ground plan?

[Objected to by Plaintiff's Attorney.]

*A.* Yes, sir.

*Q. No. 471.* Did the bottom side pieces of the car Columbus extend only flush, or even with the box part of the body, as in Plaintiff's Exhibit No. 4, or did they extend beyond the box part of the body, as shown in the Defendant's model K?

[Objected to by Plaintiff's Attorney.]

*A.* They extend past, as shown in the model K.

*Q. No. 472.* Will you measure the dimensions of the sliding windows in the Plaintiff's Exhibit No. 4, at the scale of three quarters of an inch

to the foot, and also state the number of such sliding windows or openings in said Exhibit, on a side; and after having answered, state the dimensions and number of the sliding windows or openings in the car Columbus, when she was first built, on a side?

[Objected to by Plaintiff's Attorney.]

A. The openings in this Exhibit are three feet and a half an inch, by two feet, and six of them on a side. As near as I can recollect, they were about two feet square, and nine of them, I think, in the Columbus.

Q. No. 473. State the size of the panes of glass in the Plaintiff's Exhibit No. 4, on a scale of three quarters of an inch to the foot, and state the number of them on a side; and after having answered, state the size and number of the panes of glass in the car Columbus, on a side, when she was first built, as near as you recollect.

A. The size here, is ten by twelve, on Plaintiff's Exhibit, and eighteen lights, exclusive of the doors; I think there was twenty-seven in the Columbus, showed, seven by nine, or eight by ten, I don't know which.

Q. No. 474. Will you look at the top side piece of the body, in the Plaintiff's Exhibit No. 4, and state its breadth, at the scale of three quarters of an inch to the foot, and also the breadth of the side piece in the Exhibit, under the window sash, and state if they differ from the car Columbus, and how the body of said car was built in this respect?

[Objected to by Plaintiff's Attorney.]

A. The top rail here is about two and a fourth inches wide; the rail under the window is about three and a fourth, in Exhibit No. 4; and in the Columbus, the top rail that the roof rested on, was from four to five inches wide; the rail under the sash was about an inch and a half, or two inches.

Q. No. 475. Why was the top side piece of the body, in the Columbus, made large and strong, as it was; and does this Exhibit, marked Plaintiff's Exhibit No. 4, show the top side piece of the body as supporting the roof, or is it shown without any roof resting on top of it?

[Objected to by Plaintiff's Attorney.]

A. The top rail of the Columbus was made strong to support the roof and any ordinary weight that might be necessarily placed upon it. In this Exhibit No. 4, there is no portion of the roof shown at all.

Q. No. 476. Has this Plaintiff's Exhibit No. 4, any iron baggage rods, with iron uprights, upon top of the body, such as were on the Columbus, when first built. Has this Exhibit of the Plaintiff's a differently constructed and different kind of fixture or railing on top?

[Objected to by Plaintiff's Attorney.]

A. The finish on the top of the body, in the Exhibit, is entirely different from the finish of the Columbus at any time.

Q. No. 477. Will you now look at the trucks on the said Plaintiff's Exhibit No. 4, and state first, if the perch there, on the Exhibit, is shown as tapered, and without hownes; and state how the Exhibit shows the perch, as connected to the bolster and cross pieces, and then state how the perch of the Columbus was constructed, shaped and connected to the bolster and cross pieces, when first built?

[Objected to by Plaintiff's Attorney.]



A. The perch here, in Exhibit No. 4, is represented to be reduced from the front cross piece, to half its thickness, where it passes through the middle bolster or middle cross piece of the truck; the top side of it is represented to be about an inch and three quarters below the upper side of the cross piece, and if let in from the top of the middle cross piece, would cut it about half in two; there are no hownes represented on this drawing. The perch of the Columbus was continued the same size the length of the frame, notched down so as to show about two inches above the cross timbers, and a roller inserted to come up about fair with the top of the perch—the roller operating on the ring in passing curves and switches; it had hownes firmly bolted on the frame.

Q. No. 478. How many rollers had the car Columbus inserted in each middle cross piece, for the ring to rest on; and are any such friction side rollers shown in the Plaintiff's Exhibit No. 4?

[Objected to by Plaintiff's Attorney.]

A. There were two in each middle cross piece, in the Columbus. Nothing here representing rollers in this Exhibit No. 4.

Q. No. 479. Were the side pieces of the truck frames of the car Columbus, when first built, single timbers, with plain boxes for the journals to run in; and what kind of side pieces and boxes are those shown in the Plaintiff's Exhibit No. 4?

[Objected to by Plaintiff's Attorney.]

A. The side pieces on the Columbus were single pieces of timber, with plain boxes; I do not know whether these are intended to represent a double side piece or a single one, in the Exhibit No. 4; these are friction wheel boxes, I judge, in the Exhibit.

Q. No. 480. Did the friction wheel boxes there shown, in Plaintiff's Exhibit No. 4, require double side pieces or timbers secured together, when they were used or tried in the year 1832?

[Objected to by Plaintiff's Attorney.]

A. All that I ever made did.

Q. No. 481. Has that Plaintiff's Exhibit No. 4, either the rod of iron extending across under the bolsters of the trucks, or the iron safety connection between the trucks, that the Columbus had when she was first built?

[Objected to by Plaintiff's Attorney.]

A. It has not.

Q. No. 482. Has that Plaintiff's Exhibit No. 4, the steps at the end outside, and the opening at the head of the steps, with the iron uprights tipped with brass balls, and ropes extending from them, which the Columbus had when she was first built, and as shown by the Model, Defendant's Exhibit K?

A. There is nothing of the kind represented here on this Exhibit No. 4.

Q. No. 483. Will you measure the distance on the Plaintiff's Exhibit No. 4, from the top of the bottom rail to the bottom of the top rail on the body, and state what it is at a scale of three quarters of an inch to the foot; and after having answered, state what was the height of the body of the car Columbus, from the floor to the roof inside?

A. This Exhibit No. 4 measures 5 feet 6 1-2 inches from the top of the bottom rail to the bottom of the top rail. From the floor of the

Columbus to the roof inside, I think was about six feet; it ought to have been to the lining in the top inside.

*Q. No. 484.* Will you explain the words of your answer as written down, viz., "From the floor of the Columbus to the roof inside, I think was about six feet; it ought to have been to the lining in the top inside," and also state, if the height of the Columbus inside was sufficient for an ordinary sized man to stand up in with his hat on?

*A.* I merely meant to give the exact distance from the floor to the lining inside of the top. An ordinary sized man could just about stand up in it without his hat touching.

*Q. No. 485.* Was the distance then from the floor to the lining less or more than six feet?

*A.* It might possibly have been less or more. A tall man's hat would strike, I recollect, very well.

*Q. No. 486.* Will you measure the width of the wooden railing on the top of the body of the Plaintiff's Exhibit No. 4, and state what it is on a scale of three quarters of an inch to the foot?

*A.* About an inch and three quarters.

*Q. No. 487.* With what kind of instruments have you made the measurements of Plaintiff's Exhibit No. 4?

*A.* A proper drawing scale and dividers, made for the purpose of drawing.

*Q. No. 488.* Will you read to the Commissioner, from your time book, heretofore produced at the request of the Plaintiff's Attorney, the entry made therein on the 4th of July, 1832, and state if you are a member of any Christian denomination, and of what denomination?

[The Plaintiff's Attorney objects to the reference to said book, and the entry therein made, on the ground that the Defendant's Attorney declines to file the book as an Exhibit, and on other grounds. Defendant's Attorney remarks that the book was not first produced at his, Defendant's Attorney's request, and Defendant's Attorney neither owns, possesses, or controls it.]

*A.* There is a column which is blank in the time book. In that column is written, "Set apart as a day of humiliation and prayer to the Divine Being to stay the cholera." I am a member of the Methodist Episcopal Church, and have been for thirty-four years.

The re-examination having been read to the witness, and he desired to correct any errors or misstatements therein — he did not desire that any corrections should be made.

C. GATCH.

LEVIN GALE, *Com.*

[The Defendant's Attorney requests the Plaintiff's Attorney to file as Exhibits in this case, the pay-rolls for November and December, 1830, and January, February, and March, 1831, offered by him to the witness on cross-examination. And also to produce to Defendant's Attorney, all the other papers obtained by him or Ross Winans, the Plaintiff, from the files or records of the Baltimore and Ohio Railroad Company's office, for his inspection. The Plaintiff's Attorney declines to file at this time the said original pay-rolls, because they are required in other suits now pending in other Circuits, and he [?] with the Commissioner

herein, copies of the said pay-rolls, and asks the said Commissioner to compare the said copies with the said originals, and if found to be correct copies, to return them with this deposition, as a part thereof. The Plaintiff's Attorney also adds, that the said original pay-rolls will be produced, properly authenticated by the witness, Conduce Gatch, on the hearing of this cause. He also tenders to the Attorney for the Defendant, the privilege of obtaining copies of the said pay-rolls for his own use from the Commissioner, which said pay-rolls are now in the hands of the said Commissioner.

And the said Conduce Gatch, being further cross-examined on behalf of the Plaintiff, further says :

X Q. No. 489. Will you now turn to page 29, of Col. Long and Capt. McNeill's narrative, a book produced by the counsel for the Defendant, and presented by him to the witness, in the re-direct examination, and state whether you do not find, on said page, the following language ?

"At the time of submitting this project, the President of the Company verbally informed the board of engineers, 'that a plan for the organization of the engineer department of the Baltimore and Ohio R. R. Co., providing a system for the government of the same, and *for securing a strict accountability in the fiscal operations of said company, and economy in the disbursement of its funds,*' had been referred to this board for examination, in order that such amendments might be suggested as the board might deem beneficial."

And on the next page ?

"Article 7—Points out the manner of keeping and rendering accounts for disbursements, quarterly abstracts, accounts current, and the disposition to be made of them."

And on the next page ?

"The regulations, as amended and adopted, were printed at the instance of the Board of Directors, and copies thereof furnished to the different agents of the company, for their information and government (see Document L, page 14, of Appendix)."

"7th. The following instructions will be observed, in keeping and rendering accounts for disbursements made on account of the Baltimore and Ohio Railroad : Bills of parcels, with explicit receipts, must be taken for all purchases and expenditures, except those for services ; and must set forth the nature, quality, price and other circumstances connected with them, which may be necessary to afford a clear view of the subject. There must be also attached to them a certificate from the disbursing officer, declaring, as the case may be, the article purchased to have been received, or the objects of expenditure to have been effected ; and stating distinctly and particularly, for what purposes the articles or objects were intended. Expenditures for services must be exhibited on separate monthly rolls, for the services of laborers and mechanics, respectively, during each month ; and must also contain a certificate, declaring that the services charged were performed, and as far as possible must state the objects to which they were applied."

[Objected to by Defendant's Attorney.]

Thereupon, and before putting the question, and before the attorney for the Plaintiff had announced *whether the question was closed*, by consent of the respective attorneys, adjourned until the 6th day of June, 1853, at 4 o'clock, P. M.

On this 6th day of June, 1853, at 4 o'clock, P. M., neither party ap-

## 578 DEPOSITION OF THOMAS MURPHY, FOR RESPONDENTS.

pearing, nor the witness, nor any attorney for either party, the Commissioner adjourned until to-morrow morning, at 10 o'clock, A. M.

On this 7th day of June, 1853, before 10 o'clock, A. M., William W. Hubbell, Esq., appeared, and informed the Commissioner that the witness, Conduce Gatch, was compelled by attachment to appear before the District Court of the United States for the District of Maryland, at 10 o'clock, A. M., and that it was necessary that he should also attend the said Court, at that hour. And at 10 o'clock, neither party appearing, nor the witness, nor any attorney for either party, the Commissioner adjourned until to-morrow morning, at 10 o'clock, A. M.

On the 8th day of June, A. D. 1853, at 10 o'clock, A. M., appeared William W. Hubbell, Esq., attorney for the Defendant, and the witness, Conduce Gatch; but the said Plaintiff did not appear, nor any attorney, on his behalf. Thereupon adjourned until to-morrow morning, at 10 o'clock, A. M. And on the 9th day of June, 1853, appeared before me, the Commissioner, William W. Hubbell, Esq., attorney for the Defendant, and the witness, Conduce Gatch; but the said Plaintiff did not appear, nor any attorney on his behalf. Thereupon the Defendant's attorney demanded that the deposition of the witness, Conduce Gatch, should be closed, and the Defendant allowed to proceed with the examination of other witnesses. The Commissioner accordingly closed the deposition of the said Gatch, first propounding to him the question above set forth, which, as above stated, the Plaintiff's attorney had not declared to be closed, and took the answer of the said Gatch, as hereunder written.

A. The quotations are correct.

C. GATCH.

Sworn to and subscribed by Conduce Gatch, in the presence of  
LEVIN GALE, *Commissioner*.

## DEPOSITION OF THOMAS MURPHY.

Thereupon Thomas Murphy appeared before me, a witness produced on behalf of the Defendant, and in the presence of William W. Hubbell, Esq., attorney for the Defendant, I proceeded to take the deposition of the said Thomas Murphy, as follows, to-wit:

And the said Thomas Murphy (being of sound mind and) being by me first carefully examined and cautioned, and duly sworn according to law to testify the whole truth, and being examined on behalf of the Defendant, makes oath, deposeth and saith, as follows, to wit:

Q. No. 1. Please state your age, residence and business, and how long you have been engaged in your present business.

A. I am in the seventy-second year of my age. I reside in the city of Baltimore. I am senior editor and proprietor of the Baltimore American and Commercial Daily Advertiser, a newspaper printed and published in Baltimore, and have been so engaged forty-three years, with the exception of a few weeks. I bought the paper on the first of July, 1810, and commenced the publication on that day. It was then a paper of several years standing, it having been commenced in 1798 or 1799.



*Q. No. 2.* Do you keep a regular file of the said Baltimore American in the office of said paper, in this the city of Baltimore?

*A.* We do.

*Q. No. 3.* Will you please produce the file of said Baltimore American, containing the paper published on the 4th of July, 1831, and then turn to the paper of said date, and read the heading, the date, and the name of the firm, and place of publication therefrom, and find an article in the editorial column thereof, headed "Ohio Railroad," and read the whole of said article to the Commissioner?

*A.* This is the file of said Baltimore American, containing said paper. The heading is as follows: "American and Commercial Daily Advertiser. Baltimore, Monday morning, July 4, 1831. Published every morning, by Dobbin, Murphy and Bose, No. 2 South Gay Street."

"*Ohio Railroad.*—The Gazette states that the capacious car Columbus will be on the Ohio Railroad to-day, and will join in the regular trips. Should the steam engine be in order, the Columbus will make regular trips to the Half-way house during the day, and as she can accommodate a hundred passengers each trip, all who may apply will have an opportunity of using this novel method of locomotion."

That is the whole of the paragraph, and all in relation to that subject.

*Q. No. 4.* Was the article you have just read published in the said Baltimore American of the 4th of July, 1831?

*A.* Yes.

THOS. MURPHY.

Thereupon adjourned until tomorrow morning, at 10 o'clock, A. M.

#### DEPOSITION OF ISAAC MONROE.

On this 10th day of June, 1853, appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, and Isaac Monroe, a witness, produced on behalf of the Defendant, but neither the Plaintiff, nor any attorney on his behalf, appeared before me on this day.

And the said Isaac Monroe (being of sound mind) being by me first carefully examined and cautioned, and duly sworn, according to law, to testify the whole truth, and being examined on behalf of the Defendant, makes oath, deposeth and saith, as follows, to wit:

*Q. No. 1.* Please state your age, residence and business, and how long you have been engaged in your present business, and where you have been so engaged.

*A.* I am in the sixty-third year of my age, reside in Baltimore, and am one of the editors and one of the proprietors of the Baltimore Patriot. I have been engaged upwards of thirty years in Baltimore, in my present business. I was formerly sole editor and proprietor of that paper.

*Q. No. 2.* Was the Baltimore Patriot a newspaper published by you in Baltimore, in the year 1831, and before and subsequently, and do you keep a file of the said paper, published by you, in your office in the city of Baltimore?

*A.* Yes, sir.

*Q. No. 3.* Will you please produce the file of said Baltimore Patriot,

580 DEPOSITION OF JOHN S. SUMNER, FOR RESPONDENTS.

containing the paper of said name, published by you on the 24th of June, 1831, and read the heading of the same, with the name of the publisher, place, and date of publication, and find in the editorial column of the same an article, headed "The Railroad Car Columbus," and read the whole of said article in answer hereto?

A. The paper is headed "Baltimore Patriot and Mercantile Advertiser. By Isaac Monroe, corner of Baltimore and North Streets, opposite the Franklin Bank. Daily paper, \$8. Country, \$5 per annum, payable in advance. All advertisements appear in both papers." Now comes the date of the paper in the editorial column. "Baltimore, Friday, June 24, 1831."

"*The Railroad Car Columbus.*—A spacious new carriage running upon eight wheels, will appear upon the Baltimore and Ohio Railroad on Monday next. It surpasses all others for size and extent yet placed on the rails, and will carry one hundred and fifty passengers. It has a promenade on top, surrounded by an iron railing, handsomely ornamented, and is provided with a number of settees above and below. It is, to all appearance, the most comfortable and attractive of any that we have yet seen.

"On Monday the trial of locomotive engines commences, and the experiments will be continued on Tuesday and Wednesday following."

That is all the article.

Q. No. 4. Was the foregoing article printed and published in the said Baltimore Patriot, on June 24th, 1831?

A. Yes, sir.

ISAAC MUNROE.

Sworn to, and subscribed before

LEVIN GALE; *Com.*

DEPOSITION OF JOHN S. SUMNER.

John S. Sumner having been produced on behalf of the Defendant, being of sound mind, and being by me first carefully examined, and cautioned, and duly sworn according to law, to testify the whole truth, and being examined on behalf of the Defendant, makes oath, deposeth and saith, as follows, to wit:

Q. No. 1. Please state your age, residence and occupation?

A. I am thirty-four years of age, reside in the City of Baltimore, and I am the Librarian of the Library Company, of Baltimore.

Q. No. 2. Will you explain the objects of the company of which you are librarian, and state whether you have a file, in bound volumes, of the newspaper, formerly published in Baltimore, called the "Baltimore Gazette and Daily Advertiser"? and if you have, produce the volume or file of the said Gazette for the year 1831.

A. The objects of the company are to collect and preserve books and other printed publications, and also manuscripts and maps, etc. We have a file, in bound volumes, of the said paper. This is the volume for that year.

Q. No. 3. Will you please turn to the said paper, printed and published January 19th, 1831, and read the heading and date thereof, volume and number; and then turn to the editorial column thereof, and read the heading and date thereof, and the editorial article therein, headed "The Snow and the Railroad."

A. The paper is headed as follows, viz :

"Baltimore Gazette and Daily Advertiser. Vol. 75. Wednesday Evening, January 19, 1831. No. 12,422."

The editorial column is headed as follows, viz :

"Baltimore, Wednesday, January 19, 1831."

Then follows the following editorial, viz :

"*The Snow and the Railroad.* In addition to the information contained in the annexed paragraph from the American, we are enabled to state from good authority, that the suspension for a single day, of the travel upon the railroad, was not caused by the difficulty of removing the snow from the rails; for that could have been done with greater ease, immediately after the storm had ceased, than at any other time; but by the violence of the wind, which rendered the efforts of the persons who attempted to clear the track, entirely abortive. So great a drift as that which accompanied the late snow, does not often occur, and under ordinary circumstances, the accumulation of snow in the deep cuts, will not be greater than upon the other parts of the road. The difficulty of clearing the tracks, therefore, entirely arises from the drifts, which are of rare occurrence; and in point of time, of limited effect.

"The cars perform the journey to and from Ellicott's Mills, with their accustomed celerity and promptness of departure, while almost every other road leading to our city is more or less obstructed by the masses of drift snow. A traveller who has just come in from the road, informs us that the passage of the car through the immense banks of snow, afforded a most picturesque and interesting sight.

"The railroad is now furnishing a conveyance for wood in considerable quantities for the use of the city, and we shall be happy to hear that our friends of the district are enabled to obtain their supply of fuel by the canal with equal facility, and at as small expense.

"We are not a little gratified in being able to state that notwithstanding the violence of the snow storm which prevailed here on Friday night last and the whole of the following day, covered the ground on a level to the depth of twenty inches at least, literally blocking up all the turnpike and other roads in every direction, and suspending the receipt of some of the mails for eighty-four hours—the travel on the Baltimore and Ohio Railroad has only been suspended one working day. The weather on Saturday was so tempestuous, that nearly all communication between the city and country was cut off, and but few persons, indeed, were seen moving through the streets. Of course, no travelling was attempted on that day on the railroad. On Monday morning a brigade of cars started from the depot on Pratt street, and by the afternoon all obstructions between the depot and the valley of the Patapsco were removed, there being none of any consequence on the line above. The regular travel on the whole line was resumed yesterday, and the excellent order of the road may be inferred from the fact that the cars traversed the entire distance from the mills to Baltimore in seventy-five minutes.

"We learn that the greatest snow drifts in the cuts were from five to ten feet deep, but these were easily and rapidly removed by the operation of the machinery which was used for the purpose. When it is recollected that so heavy a fall of snow has not been experienced here for forty years, and that the depth of the snow drifts is not exceeded by any which had been witnessed by the oldest inhabitants, we think we may safely aver that incontestible proof has now been afforded, that, under no circumstances, need any fear be entertained that the operations of the railroad will ever be obstructed twenty-four hours, at any time, by snow. To the immediate friends of our noble enterprise in particular, as well as to those who feel interested in other works of a similar kind, the result just ascertained is

of the most cheering and important character. A certain and uninterrupted communication *at all seasons*, is perhaps as important a consideration in a channel of intercourse between distant points, as any single one which could be named. At all events, it is an advantage, which, admitting all things else to be equal, will give to railroads a decided superiority over any other mode of conveyance."

Q. No. 4. Will you now turn to the said Gazette, in the same volume, printed and published on the 2d of July, 1831, and read the heading, volume, date and number thereof; and then read the heading and date of the editorial column, and find and read, in said column, the whole of the article therein printed, headed, "The capacious car Columbus"?

A. The paper is headed as follows, viz.:

"Baltimore Gazette and Daily Advertiser. Vol. 76. Saturday Evening, July 2, 1831. No. 12,564."

The editorial column is headed as follows, viz.:

"Baltimore, Saturday, July 2, 1831."

"The capacious car *Columbus* will be on the Baltimore and Ohio Railroad to-morrow, and Monday, the fourth of July, and will join in the regular trips. Should the steam engine be in order, the *Columbus* will make regular trips to the Half-Way House, during the day, and as she can accommodate a hundred passengers each trip, all who may apply will have an opportunity of using this novel method of locomotion.

"A plentiful supply of provisions, of various kinds, was sent up to the distressed families of the workmen belonging to the third division of the railroad, this morning, by order of the Directors."

That is the whole of the article.  
Sworn to and subscribed, before  
LEVIN GALE, Commissioner.

JOHN S. SUMNER.

Thereupon adjourned until to-morrow morning, the 11th of June, 1853, at 10 o'clock, A. M.

On this 11th day of June, 1853, appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney before [?] the Defendant, and John S. Sumner, the witness examined yesterday; but the Plaintiff did not appear, nor any attorney on his behalf, during the course of the day.

And the said John S. Sumner being re-called and re-examined on behalf of the Defendant, further says, as follows, to wit:

Q. No. 5. Please produce the file of the said Baltimore Gazette and Daily Advertiser, printed and published in the year 1830, and turn to the said paper, printed and published on the 17th of December, 1830, and read the heading, volume, date and number thereof; and then read the heading and date, and the whole of the first article, headed *Ex-President Adams*, of the editorial column of said paper.

A. The volume I now produce is the file of said paper for the year 1830. The heading is as follows, viz.:

"Baltimore Gazette and Daily Advertiser. Vol. 74. Friday Evening, December 17, 1830. No. 12,386."

The editorial column is headed as follows:



"Baltimore : Friday, December 17, 1830." "Ex-President Adams and his lady, *Sir William Campbell*, and several other strangers, accompanied by the President and some of the Directors of the Baltimore and Ohio Railroad Co., made an excursion up the road this morning. Mrs. Adams's carriage, with the horses, was, we learn, placed upon a trussel attached to one of the railroad cars, and taken as far as to the Relay House, at Elk Ridge landing, from which place it proceeded to Washington by the Turnpike Road.

"We understand that the Rail Road Company have prepared several of these trussels, by which either wagons or pleasure carriages may be transported along the road without being unloaded, or putting the passengers to the inconvenience of getting out of their own carriages. This is certainly a new and important facility which this admirable system is capable of affording."

That is the whole of the article.

JOHN S. SUMNER.

Sworn to and subscribed before

LEVIN GALE, Commissioner.

### DEPOSITION OF LEONARD FORREST.

The Defendant here produced Leonard Forrest. And the said Leonard Forrest having been by me first carefully examined and cautioned, and duly sworn, according to law, to testify the whole truth, (and being of sound mind) and being examined on behalf of the Defendant, makes oath, deposeth, answereth and saith, as follows, to wit :

*Q. No. 1.* Please state your age, residence, and occupation or business.

*A.* My age is in the 59th year. My residence is No. 9 Henrietta Street, South Baltimore ; and I am a blacksmith.

Thereupon adjourned (as to-morrow will be Sunday) until Monday morning, the 13th day of June, 1853, at 10 o'clock, A. M.

On this 13th day of June, 1853, at 10 o'clock, A. M., appeared before me, William W. Hubbell, Esq., Attorney for the Defendant, and the witness Leonard Forrest, and Charles D. Gould, Esq., Attorney for the Plaintiff. I here, at his request, exhibited to the said Charles D. Gould, Esq., the depositions that had been taken in his absence ; and he then asked that the witness, Conduce Gatch, should be recalled, which, being objected to by the Defendant's Attorney, was not done on the ground that the deposition of said Gatch had been formally closed, and he dismissed by the Commissioner, after having attended several times, pursuant to adjournment ; and the Plaintiff's Attorney was absent. Thereupon I further proceeded with the deposition of the witness, Leonard Forrest, as follows, to wit :

*Q. No. 2.* How long a time have you resided in Baltimore ; and how long, or since what time, have you been engaged in the business of a blacksmith ?

*A.* I have resided in Baltimore all my life ; never lived out of Baltimore, at any time, twelve months. I have been engaged in the business of a blacksmith since I was fifteen years of age ; I was apprenticed when I was fifteen years of age.

*Q. No. 3.* Did you ever work for the Baltimore and Ohio Railroad

Company? if you did, state when you first commenced to work for them, and what kind of work you did for them.

A. I worked for them; I commenced to work for them in June, 1830; I did all such smithwork as was brought to me by my employer.

Q. No. 4. Who was your employer at that time?

A. Conduce Gatch.

Q. No. 5. For what purpose was the smithwork, made by you, used at that time? say 1830?

A. It was for cars of different kinds.

Q. No. 6. What kind of cars, and where were they used, and where was the work done by you, in 1830?

A. The work was done at the Mount Clare depot; some were four-wheel trucks; some eight-wheels, for hauling timber and wood; they were used on the Baltimore and Ohio Railroad.

Q. No. 7. What kind of wood were the eight-wheel cars used to haul on the Baltimore and Ohio Railroad, for which you did the work, in 1830?

A. There were some built to haul long timber on, for the use of the road; some built for drawing cord wood on, hauling cord wood on.

Q. No. 8. Do you recollect of any other eight-wheel cars on the Baltimore and Ohio Railroad, in 1830? if so, for what purpose were they used, and who did the iron work for them?

A. There were cars built for carrying stock on, carriages and horses; I did the iron work for them.

Q. No. 9. At what time were the eight-wheel cars, for carrying cord wood on the Baltimore and Ohio Railroad, first put together and used?

A. In the fall of 1830, along that time, in the early part of the fall.

Q. No. 10. At what time was the eight-wheel car, to transport carriages and horses, first put together and used on the Baltimore and Ohio Railroad?

A. That was along the fall of 1830, as well as I recollect; in the fall of 1830, in the neighborhood of the same time as the wood cars.

Q. No. 11. What kind of eight-wheel cars were next built, if any, on the Baltimore and Ohio Railroad, and when was such car built? name it, if it had a name, and state who did the smith work for it.

A. There was a car called the Columbus, a passenger car; she was built in the spring of 1831; I did the smith work for her.

Q. No. 12. Under whose instructions, or by whose directions, were these eight-wheel timber cars, eight-wheel wood cars, eight-wheel carriage and horse car, built in 1830?

A. Conduce Gatch.

Q. No. 13. Under whose instructions, or by whose direction, was the eight-wheel passenger car Columbus built, in the spring of 1831?

A. By Conduce Gatch, sir.

Q. No. 14. Where were these eight-wheel timber cars, eight-wheel wood cars, eight-wheel carriage and horse cars, and eight-wheel car Columbus used? on what road, and for what length of time, were those or similar cars in use on the said road? and state if they were on the same principle as the eight-wheel cars now in general use.

A. They were used on the Baltimore and Ohio road; they were in use on that road from that time up to the present; they were on the same principle, with the exception of the drawing part.

*Q. No. 15.* Do you mean to say, in answer to the foregoing question, and its several parts, that those eight-wheel cars and similar ones have been used, from time to time, since then, up to the present time; and that they were on the same principle as those now in use, with the exception of the drawing part?

*A.* Yes.

*Q. No. 16.* Who worked at the Mount Clare shops, that you now recollect, in 1830, and in the spring of 1831?

*A.* Gatch was foreman; a man by the name of Rupp—Jacob Rupp—he worked there; Francis Gatch, Michael Glenn, Washington Frost, Oliver Cromwell, John Eichelberger; there were more of them, but I can't recollect their names; myself was one, of course.

*Q. No. 17.* Will you describe the eight-wheel timber cars used for hauling timber in building the road, in 1830?

*A.* They were cars similar to model E, with a standard in the end of the bolster, instead of those fore and aft pieces in model E; model E is the cord wood car.

*Q. No. 18.* What kind of timber were the eight-wheel timber cars used to haul on the road, in 1830?

*A.* For hauling long timber for laying the track.

*Q. No. 19.* Were the long timbers, hauled to construct the road, laid upon the bolsters? and did they rest there by their own weight, or were they fastened there in any way, in 1830?

*A.* Rested by their own weight; I did not see any fastened.

*Q. No. 20.* When so hauled along, to construct the road, did workmen or persons get on them and ride along the road, on these timber cars?

*A.* Oh yes, sir; they could get on the timber any where, and sit there and ride on it; I have rode on them myself.

*Q. No. 21.* How did the eight-wheel cord wood cars, used in 1830, differ from the timber cars used to haul long timbers?

*A.* Because they had long pieces connected to the bolsters, and standards at each end of those long timbers.

*Q. No. 22.* In what way were the long pieces of the wood cars connected to the bolsters? by what was the connection made?

*A.* They were notched in, and then a bolt bolted down through the two pieces.

*Q. No. 23.* Will you look at the model marked "model E," and say what it represents, and when and where you first saw the car represented by it, constructed and used?

*A.* That is a correct model; the first that I ever saw used, was on the Baltimore and Ohio road in 1830; I saw them there.

*Q. No. 24.* For what purpose were the cars of which model E is a correct model, used in 1830, on the Baltimore and Ohio Railroad?

[Objected to by Plaintiff's Attorney.]

*A.* It was used for hauling cord wood on; that was the intention of them.

*Q. No. 25.* How many cord wood cars, similar to model E, do you recollect were constructed, and in use on the Baltimore and Ohio Railroad in the year 1830?

*A.* I can't say to the number, some six or eight or more; I can't name the number.

**Q. No. 26.** Who made the king bolts for the eight-wheel wood cars constructed and used on the Baltimore and Ohio Railroad in 1830, similar to model E?

**A.** That is, the centre bolts that go down; I made them, sir.

**Q. No. 27.** How did the eight-wheel carriage and horse cars constructed and used in 1830, differ from the eight-wheel wood cars used in the same year?

**A.** They had a flooring confined down on them, and a railing; a frame around of the height of a horse.

**Q. No. 28.** How were they constructed to get the carriages and horses into them, and who did the iron work for them?

**A.** They had an apron to let down, fastened on hinges; I did the iron-work for them.

**Q. No. 29.** Who invented or designed the eight-wheel wood cars and carriage and horse cars used on the said road in 1830?

[Objected to by Plaintiff's Attorney.]

**A.** Conduce Gatch was the man, sir; I never heard of any one else at that time.

**Q. No. 30.** Will you look at or examine the model car, marked Defendant's Exhibit K, and say what car that represents, and when and where the car was constructed and first used?

**A.** I think it is a correct model of the car called Columbus. She was constructed at Mount Clare Depot, in the spring of 1831, and used on that road.

**Q. No. 31.** What is the name of the road she was used on?

**A.** Baltimore and Ohio road.

**Q. No. 32.** What kind of boxes had the trucks of the car Columbus on, when she first came out of the Mount Clare shops, on to the road, in 1831; and who made the iron work for them?

**A.** She had boxes something representing those on model K, what we term plain boxes. I made all the iron work for her, with the exception of the wheels, and axles, and the bearings.

**Q. No. 33.** What work did you do about the plain boxes that were on the Columbus when first built in 1831?

[Objected to by Plaintiff's Attorney.]

**A.** I made the bolts to bolt them on to the side frames.

**Q. No. 34.** What kind of a finish on top had the car Columbus when she was first put on the road in 1831, and state the time in 1831 when she was first used on the road?

**A.** She had a railing like unto this on model K, about nine or ten inches in length, with two rods passing around as here in model K. There was a scroll on top of the uprights something similar to those on model K. She was put in use on the 4th of July, 1831, on that day.

**Q. No. 35.** What material were those two rods and uprights on top of the Columbus made of; who made them, and who designed the scroll on the uprights?

**A.** They were made of wrought iron; I made them, and I designed the scroll on the uprights.

**Q. No. 36.** What kind of finish had the car Columbus at the corner on top, and who made the finish when she was first built?

**A.** There was steps went up, and standards at each side of the



steps on top, with a little brass ball on top of them. I made the standards.

*Q. No. 37.* Was the car Columbus afterwards altered; and if yea, when and where was she altered?

*A.* She was altered, I think, in 1832, at the depot on Pratt Street, in the work shops on the back of the lot at the corner of Camden and Charles Streets.

*Q. No. 38.* Where was the Mount Clare Depot situated?

*A.* At the west end of Pratt Street.

*Q. No. 39.* What alteration was made in the Columbus in 1832, at the Charles Street shop, that you recollect of?

*A.* I can't recollect of much alteration about her; I think she had new trucks put under her. She was fitted up with an awning on top. Those standards were altered, lengthened out and fitted up, and an awning placed on them.

*Q. No. 40.* What kind of materials were the standards for the awning made of, and who did the work? who made them?

*A.* They were all of wrought iron; the whole frame was of wrought iron. I made it.

*Q. No. 41.* Had the Columbus ever a wooden railing on top of the body? and if so, when did she first have such railing?

*A.* She never had any such railing. I knew her from the time she was built until she was rotten. I worked for the road until she was entirely knocked to pieces by old age, and racked up.

*Q. No. 42.* When the Columbus had the iron railing for the awning on top, put there in 1832, at the Charles Street shop, had she any net work at the same time, placed around the top? State fully.

*A.* She had wire work on top—wire net work; that was when she was altered; she had none there when she was first built.

*Q. No. 43.* What kind of boxes had her trucks put on them, when the new trucks were placed under her in 1832, at the Charles Street shop?

*A.* I think they had Winans's friction boxes then put on.

*Q. No. 44.* Were the Winans's friction boxes large semi-circular boxes?

*A.* They were, sir; they were castings over the friction wheels, large castings to cover the friction wheels; they hid the friction wheels altogether, so that they could not be seen.

*Q. No. 45.* Were other eight-wheel wood cars and passenger cars, afterwards built; that is, after the eight-wheel cars of 1830, and the Columbus of 1831, were built? and if so name some of them.

*A.* Yes, there were numbers of them built afterwards. Passenger cars were built—one called the Winchester, with eight wheels; one called the Dromedary, and another one—I disremember the name—built about that time—a passenger car.

*Q. No. 46.* Who invented or designed the car Columbus, built in the spring of 1831?

*A.* I always understood Conduce Gatch did. I never knew any one else to have any say about it.

*Q. No. 47.* In what way was the car Columbus, and Winchester, and Dromedary, and the other car drawn? Was there any difference in the mode in which they were drawn?

A. There was no difference in the mode of drawing them. They were drawn by perches, similar to this one in model K, connected to the trucks.

[Recess until four o'clock, P. M.]

At four o'clock, P. M., adjourned until to-morrow morning, at 10 o'clock, A. M.

On the 14th day of June, 1853, appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, Charles D. Gould, Attorney for the Plaintiff, and the witness, Leonard Forrest; and thereupon, I further proceeded with the deposition of the said Leonard Forrest, as follows, to wit:

Q. No. 48. What kind of cars did you do the iron work for, in the year 1830, for the Baltimore and Ohio Railroad Company?

A. I done the work for all the cars they put up, of all forms, eight-wheels, four-wheels, and all, with the exception of the wheels and axles, which I never made at all. I never had any thing to do with them; they were out of my business altogether.

Q. No. 49. For what kind of cars did you do the blacksmith work, for the Baltimore and Ohio Railroad Company, in the year 1831?

A. I worked altogether upon the passenger cars at that time.

Q. No. 50. Will you state the order, in succession, in which the eight-wheel timber cars, the eight-wheel wood cars, like model E, and the eight-wheel carriage and horse cars, and the eight-wheel car Columbus, like Exhibit K, were constructed and used on the Baltimore and Ohio Railroad; stating which was first, which was second, which was third, and which was fourth, beginning with the first?

A. The lumber cars were the first that I have any recollection of at all. The next was the wood cars; the third was the carriage and horse car; they were all made in 1830. Now the Columbus was the fourth one, made in the spring of 1831.

Q. No. 51. Did you make any iron work, or centre bolts, for any of the eight-wheel wood cars, besides or after you did the work for those in 1830? or was your smith work, after 1830, confined to passenger cars? state fully.

A. My smith's work was confined to passenger cars, altogether, after 1830.

Q. No. 52. Whereabouts, at Mount Clare, were the eight-wheel wood cars put together, in 1830? were they out of doors, on the track; or inside of the shops, under the roof?

A. They were put together out on the track.

Q. No. 53. Where was the timber pieces that were bolted together, to form the body framing of the eight-wheel wood cars, procured from; and was there, at the time, 1830, much of such timber at the Mount Clare Depot? state fully.

A. They used the timber that they made the road of—scantling, so called; there were great quantities of it lying there.

Q. No. 54. What were the running gears of the eight-wheel wood cars, that were constructed and used in 1830, made of? and how were the eight wheels arranged and connected with the body framing?

A. You have reference, I suppose, to the trucks. They were made of ash. I don't see how I can answer the last clause of the question.

I don't recollect how they were connected; that part was not connected with my business.

*Q. No. 55.* Describe the eight-wheel wood cars that were used on the Baltimore and Ohio Railroad in 1830, for which you made the iron work or smith work; describe how the trucks were fixed, and whether they were connected with bolsters and framing pieces or scantling, and centre bolts like the Model E.

[Objected to by Plaintiff's Attorney.]

*A.* Precisely in the manner of that model E. Platform cars with bolsters in the centre of them, and two long string pieces with standards at each end.

*Q. No. 56.* Will you state what the object of the small rods and up-rights, put on top of the Columbus, when she was first built, was? what they were put there for, and who directed them to be put there?

*A.* The object of putting them there was to prevent the baggage from falling off. They were directed by Conduce Gatch.

*Q. No. 57.* Who fitted and fastened those baggage rods on to the top of the Columbus?

*A.* I did, sir.

*Q. No. 58.* What was the size of the panes of glass in the car Columbus, along the sides of the body, above the sliding windows, as near as you can recollect?

*A.* Well, I don't think they were more than six by eight; they were small, very small lights.

*Q. No. 59.* What was the size of the sliding windows in the sides of the car Columbus, when she was first built, as near as you can recollect?

*A.* Well, I don't think — they were not over two feet.

*Q. No. 60.* Explain your last preceding answer, "Well, I don't think — they were not over two feet" — and state whether you mean they were not over two feet square, or in length, or breadth, or which way?

*A.* They were not over two feet in length.

*Q. No. 61.* What was their breadth, as near as you remember?

*A.* About twenty inches.

*Q. No. 62.* When the Columbus was finished, in 1831, and first put on the road, were settees bought to be put upon top of her; and for what purpose, if they were?

[Objected to by Plaintiff's Attorney.]

*A.* They were settees bought for her and placed on top for passengers to sit on; some preferred sitting on top to sitting inside.

*Q. No. 63.* Who fitted and fastened the iron railing on top of the Columbus, for the awning, in place of the baggage rods, in 1832, and where, or at what shop was this alteration made?

*A.* I fitted and fastened them up myself, at the Charles Street shop.

*Q. No. 64.* Who first suggested the changeable backs to the seats of the eight-wheel cars, on the Baltimore and Ohio Railroad, and who did the iron or smith work for the first changeable seats or backs?

*A.* Conduce Gatch suggested the plan; I done the work.

*Q. No. 65.* Who suggested the mode of drawing the eight-wheel car, on the Baltimore and Ohio Railroad?

*A.* There were a number of different ways of drawing. I should like to know which way you mean.

*Q. No. 66.* Who first suggested the mode of drawing the eight-wheel cars, on the Baltimore and Ohio Railroad, by a coupling from the middle of the end of the body?

*A.* Jacob Rupp was the man, sir, that invented that, or adopted that plan.

*Q. No. 67.* Look at the drawing now before you, marked "Plaintiff's Exhibit No. 4," and say whether the boxes on the trucks there shown, are like the boxes that were put on the Columbus when she was first built, for which you made the bolts. State fully, and what kind of boxes these on the Plaintiff's Exhibit No. 4 are.

*A.* These are not like those that were on her when she was first built; by no means. These are called Winans's friction boxes. I knew of no such a box as these at the time she was built.

*Q. No. 68.* Look at the railing on top of the drawing of a car shown by "Plaintiff's Exhibit No. 4," and state whether that is like the iron rods or fixture that the Columbus had on her when she was first built. State fully.

*A.* It is nothing like it at all — not a particle like it.

*Q. No. 69.* Is there anything in that drawing marked "Plaintiff's Exhibit No. 4," that is the same as the Columbus was when she was first built, in shape and exact particulars, excepting the wheels with spokes in them?

*A.* I don't see a thing connected with it that is like the Columbus when she was first built, excepting the drawing pin on the end of the perch, as shown in the Exhibit. The car was drawn at that day by such a pin, called then a drawing pin, now termed a coupling pin.

*Q. No. 70.* Is there any difference in the principle or mode of construction, and coupling of the two four-wheel trucks together, by centre bolts, of the model E, and the eight-wheel wood cars, for which you did the iron work or smith work in 1830, and which were used, as you have stated, on the Baltimore and Ohio Railroad? If there is any difference point it out.

[Objected to by Plaintiff's Attorney.]

*A.* I don't see there is any difference; the principle is the same; they were then coupled by king bolts.

*Q. No. 71.* Is there any difference between the Defendant's Exhibit K, in the construction and arrangement and principle, and the car Columbus, as she was first built, in 1831? If there is point it out?

[Objected to by Plaintiff's Attorney.]

*A.* When she was first built she had a safety rod under the body, between the trucks, connecting the trucks; they don't use them now.

*Q. No. 72.* I ask you if there is any difference between that model K and the Columbus, when she was first built?

*A.* No, sir. It is a correct model as possibly can be; there is nothing deficient about it.

*Q. No. 73.* Did any persons visit your house, and lay before you a smoked drawing, or drawing which appeared to be smoked, similar to "Plaintiff's Exhibit No. 4"? and state who they were and when they so visited you with such drawing.

*A.* There was three gentlemen visited my house about twelve o'clock; I can't call to mind the day though, with a smoked drawing; I should say that was the drawing.



[The witness here pointed to a drawing in the possession of the Plaintiff's Attorney, which drawing the Plaintiff's Attorney then handed to the witness. The Defendant's Attorney then asked that such drawing should be filed as an Exhibit.]

I have no recollection of the names of the persons who called on me, except Mr. Oliver Cromwell; I knew him.

*Q. No. 74.* State the time when they called, as near as you can; in what year and at what time of the year; and state if any one of the gentlemen who then called on you, with Mr. Cromwell, is now present.

*A.* It strikes me it was in the latter part of September last. I should take that to be the gentleman that visited me, from his own words only. He told me yesterday he was at my house; I should have not known him any more.

[The witness here pointed out Mr. Gould, the Plaintiff's Attorney.]

*Q. No. 75.* Did you examine the smoked drawing they presented to you? and state what you told them about it.

*A.* One of the gentlemen presented a drawing like unto that, to me, and asked me if I had ever seen a drawing like that before; I answered him, no, I had never seen a drawing of that description before. I also stated to him, or rather he asked me, if it was like the car Columbus; I pointed out that part to him (the witness here pointed to the trucks on the Plaintiff's Exhibit No. 4), and told him it was not like the Columbus.

*Q. No. 76.* Did Oliver Cromwell then say anything about the railing on top; what did he say about the railing or the trucks?

[Objected to by Plaintiff's Attorney.]

*A.* He did not say anything at all about it to me. No words passed betwixt him and me about it, at all.

Witness, LEVIN GALE, *Com.*

his  
LEONARD X FORREST.  
mark.

And the said Leonard Forrest, being cross-examined on behalf of the Plaintiff, further says, as follows, to wit:

*X Q. No. 77.* Was the blacksmith work, done by you in 1830, for the Baltimore and Ohio Railroad Company, confined to that intended for the cars which were intended to be used, or for cars in use, on the road of said company?

*A.* For cars in use and cars intended for use — building.

*X Q. No. 78.* Upon what do you depend to enable you to speak with precision and confidence, as to the things and dates of which you have spoken in your direct examination?

*A.* My recollection; I have nothing more than my recollection for it.

*X Q. No. 79.* On what occasion, or when, previous to July, 1852, and since 1830 and 1831, did you recall, or have recalled to your attention, the circumstances and dates to which you have referred in your direct examination? state fully.

*A.* I bore it in mind from time to time, knowing that I worked there, and such occurrences took place as convinced me they were facts.

*X Q. No. 80.* Did you see Philip E. Thomas, Jonathan Knight, Ross Winans, John Elgar and George Brown, about the depot and work shops at Mount Clare, in the summer and fall of 1830 and in 1831? state particularly.

*A.* I have seen Philip E. Thomas about there at that time. I recollect seeing Jonathan Knight along about 1831, about there, but not before that; George Brown, I saw him almost every day there; I have no recollection of Ross Winans until the latter part of 1831. I have seen John Elgar about there in 1831, and I think I saw him there in 1830; but I don't know about that.

*X Q. No. 81.* By what circumstance or thing do you fix the date or time you have stated it to be, in your direct examination, that such was the time at which you saw the "cord wood car," so called, in use on said road? state particularly.

*A.* I judge the time from the time I was employed by the company; I know the dates I was employed by the company, and receiving my pay.

*X Q. No. 82.* Have you a memorandum of the dates and times at which you drew your pay, and will you state just when, in each month, from the time you entered the service of said company, up to August, 1831, you received your pay? if you depend on your memory, state as near as you can.

[Objected to by Defendant's Attorney.]

*A.* I will depend on my memory. I received my pay on every fourth week after I entered the service of the company, every fourth Saturday, for some year after I entered the service of the company; then they altered it, and I received it monthly. I have nothing to depend on but my memory; that is all; that is my book, and I am prepared to sustain it too.

*X Q. No. 83.* By what circumstance or thing do you fix the time or date at which you saw an eight-wheel car, or arrangement of cars, for carrying horses and carriages, as stated by you to have been used in 1830? state particularly.

*A.* The reason was, that it was a new thing, and excited notice among the public, and I noticed it more than it would be noticed at the present.

*X Q. No. 84.* For what purpose was the said car with eight-wheels first used? state particularly.

*A.* The first car?

*X Q. No. 85.* For what purpose was the first eight-wheel car for transporting carriages and horses first used? state the occasion and object.

*A.* It was used for carrying carriages and horses on; I believe President Adams was the first that went on it, or ex-President Adams, which ever he was; don't understand me that that was the first eight wheel car; there were eight-wheel cars before that.

Thereupon adjourned until to-morrow morning, at 10 o'clock, A. M.

On this 15th day of June, 1853, at 10 o'clock, A. M., appeared before me, the Commissioner; Leonard Forrest, the witness; and Wm. W. Hubbell, Esq., Attorney for the Defendant; and Charles D. Gould,

Esq., Attorney for the Plaintiff; and thereupon I further proceeded with the deposition of the said Leonard Forrest, as follows, to wit :

*X Q. No. 86.* Do you mean to state that the horses and carriage of the late ex-President Adams transported over the Baltimore and Ohio Railroad, in 1830, in the month of December, was so transported on a single car having eight-wheels under a single body?

*A.* A single car; a car with eight-wheels made for that purpose.

*X Q. No. 87.* Will you state in detail what parts of said car were constructed for the purpose of transporting said horses and carriage.

*A.* It had a long apron with slats across it, for the horses and carriage to go up into the car.

*X Q. No. 88.* In what manner were the bearing carriages constructed? state fully.

*A.* Bearing carriages? I don't know what you mean by bearing carriages; I don't understand that phrase at all.

*X Q. No. 89.* In what manner were the four-wheel cars constructed, on which the body supporting the load rested, or in what particulars did the four-wheel cars supporting the body differ from the ordinary platform cars at that time in use on said road?

*A.* They could make a wood car or a horse car out of the platform cars by placing a floor on them and bolsters.

*X Q. No. 90.* Were the four-wheel cars that were used, the ordinary four-wheel cars that were used for transporting merchandize, or were they constructed for the special purpose?

*A.* They did use the ordinary four-wheel cars when they made an eight-wheel car; in order to make an eight-wheel car of them, they connected them with timber.

*X Q. No. 91.* How long was the said cars constructed for the purpose of transporting said horses and carriage continued in use, as so arranged for that purpose, with eight-wheels and one body?

*A.* It was in use from 1830 up to the present time, more or less—similar cars.

*X Q. No. 92.* How long was that particular car continued in use, for the purpose of transporting horses and carriages on said road?

*A.* Well, I can't say for certain how long; there were others built of the same kind.

*X Q. No. 93.* How soon after were others, precisely similar, built; and how many were so built prior to the month of October, 1831?

*A.* I can't say to the number; there were some built before that time, I know—more than one.

*X Q. No. 94.* Whom did you see at work constructing one or more of these cars for transporting horses and carriages, in 1830 and 1831, before the month of October of the last year?

*A.* I saw the hands of the company at work on them, the hands employed by Mr. Gatch; at all events I was employed by him.

*X Q. No. 95.* Will you give the names of the hands you refer to, whom you saw working upon them?

*A.* I see Jacob Rupp frequently working on them, and Michael Glenn; Washington Frost I see him working upon them; I see Francis Gatch working on them; others that I don't recollect; the names of hands that were working under Mr. Gatch; sometimes one set and sometimes another.

594 DEPOSITION OF LEONARD FORREST, FOR RESPONDENTS.

X Q. No. 96. When was the work of constructing these eight-wheel horse and carriage cars carried on or done?

A. At Mount Clare Depot.

X Q. No. 97. Will you state more particularly in what shops or at what place out of the shops?

A. I don't exactly understand that matter; the trucks were put up in the shops frequently; they were then placed on the track, and all the additional work was added to it.

X Q. No. 98. Were these eight-wheel horse cars used for any other kind of transportation as eight-wheel cars? and if yea, state for what kind of other transportation they were used?

A. They were used for nothing more than stock, of various kinds.

X Q. No. 99. What kind of stock do you recollect to have seen transported in them, and about how many head of stock, previous to the 1st of October, 1831—I mean in the eight-wheel horse cars, of which you have spoken in your previous answers?

A. Well, I have seen horses—some four or five horses at a time on. I don't know that I have seen any other kind of stock; but they were calculated to bring other kinds of stock. You could bring any kind of stock you wanted on them; I mean at that date, 1830 or 1831.

X Q. No. 100. Were the horses you saw so carried, intended for market, or were they accompanied by carriages?

A. Well, I can't say, as regards that. I have seen them with horses and carriages, and without carriages. I mean I have seen them with horses, with no carriages on the cars.

X Q. No. 101. What power was used to draw cars loaded with cattle and freight, at that time, or to which you refer? state fully.

A. In 1830, horse power.

X Q. No. 102. Do you recollect to have seen more than one instance of horses and carriages being drawn on an eight-wheel car, on said road, in 1830? and if yea, state how many, and all you recollect about each instance.

A. I have seen them a number of times, but I could not state the number of times.

X Q. No. 103. About how many times before the first of October, 1830?

A. I could not say; the road was not of much length then; there was not a great deal doing that way; it was frequently done merely as an experimental matter.

X Q. No. 104. What was the length of the platform of the said eight-wheel horse cars, and what was its width, and how was the floor made? was it framed together? please describe it fully.

A. I have no recollection about the length of them. I had nothing to do with the building of them. I know nothing about its width, either. I had no concern about that. I can't give any description of the floor, either. I am not a carpenter, but a blacksmith, by trade. I had nothing to do with the wood work. You are questioning me as if I was a carpenter. I had nothing to do with the measurements of it.

X Q. No. 105. Will you describe the appearance or construction of that part of the eight-wheel horse car, which kept the stock or horses on?

A. It was a simple framing up on the sides, of the height of a horse,



or perhaps a little higher. The ends had an apron at each end, which would let down or shut up; when shut up forming the end of the car, and closing it up.

*X Q. No. 106.* Do you recollect to have seen carriages or horses carried on four-wheel cars, on said road? if yea, when, and to what extent? State particularly.

*A.* I don't have any recollection of any.

*X Q. No. 107.* When did you first see a load of timber supported on two four-wheel cars, used on said road?

*A.* I see it in the fall of 1830; that was about the first of my seeing it.

*X Q. No. 108.* What is the principle of the eight-wheel car, in general use, with respect to its action and motion on the road, and with reference to its carriage of the load carried by it?

*A.* At what time?

*X Q. No. 109.* At any time, or the present time?

*A.* The principle is always about the same. I never saw any difference in the principle. The first were drawn by perches; now they are drawn by the bodies; but the principle is evidently the same.

*X Q. No. 110.* Did you ever hear Conduce Gatch claim to have invented the car Columbus, or to have first originated the plan of construction and arrangement on which the said car was built? Please state all you recollect to have heard him say about originating the plan of construction and arrangement of said car.

*A.* I always understood that Conduce Gatch was the principal man in building the Columbus; I never knew any one else to have any thing to say about it. He gave me all my directions that I worked by, for all the work that was done for her.

*X Q. No. 111.* When did you first hear him personally claim to have originated the construction and arrangement of the said car? state particularly.

*A.* I never heard him claim it. I never understood of any body else than him being the claimer of it, at that time, at all events.

*X Q. No. 112.* In what manner, or by what protection, if any, was the top or roof of the said Columbus protected from being bruised or chafed by baggage thrown on it, or from the feet of those riding on it?

*A.* There was canvass drawn over it, and painted.

*X Q. No. 113.* Were there not wooden slats extended across, from side to side, to protect the canvass placed over the said car?

*A.* At the time she was first built there were none. There were none when she was first built; they might have put them on when she was altered; I don't recollect about that. In 1832 she was altered. She had none in 1831.

*X Q. No. 114.* Was the said car Columbus originally constructed to carry passengers on her top, and how many would she and did she carry on her top?

*A.* I can't say how many she would carry on top. She was not constructed to carry them on top, at the first outset of her running—that is, the 4th of July, 1831. They found people preferred riding on top, so they put settees on top, when she first went into use, although she was not covered with anything.

*X Q. No. 115.* Did the said car have a settee of such width running

through the middle of the body, with a back or upright for persons to lean against whose faces were turned in opposite directions? or was it of such width only as to permit one row of persons to be seated on it?

A. There were settees, placed back to back, along the centre of the body — the centre of the roof rather.

X Q. No. 116. Was there a double settee with a back for persons to lean against, running through the centre, inside of the body of said car Columbus?

A. I disremember about that; there were seats in her, but whether they were settees, or placed there in the building of the car, I don't remember. I know there were settees on top, but whether inside or not I don't know.

X Q. No. 117. How many passengers did the said car carry outside on top?

A. That is more than I can say; I have seen so many on, that they could not sit down, one half of them.

X Q. No. 118. Did so great a number often get on her top when she first went out, in July, 1831?

A. Yes; whenever she run she was crowded on top.

X Q. No. 119. You have stated that you knew the Columbus until she was worn out; will you state what alterations were made in her?

A. I have no recollection of any alterations after 1832; she might have been altered several times; but the principle was the same until she was gone.

X Q. No. 120. Please state what you mean by "the principle was the same until she was gone"?

A. The same body on two trucks.

X Q. No. 121. Was the position of the bearing carriages or trucks under the body the same when you last knew her, as when she was first placed on the road, in July, 1831; and was she still drawn by the perch, as when first used; and were the wheels in each truck always the same distance apart? If a change in any of these respects was made, please state when it was, as near as you can?

A. Well, I could not say as to that; the trucks were altered; she was drawn by the perch all the same until the last of her.

X Q. No. 122. Was the said car Columbus a safe car when drawn in trains by the engine; and was any and what difficulty found to attend her use? state fully.

A. I never heard of any, or knew of any myself.

X Q. No. 123. In what respects did the car Winchester differ from the car Columbus?

A. There was considerable difference; one had three bodies, and the other one, in the form of Defendant's Exhibit K.

X Q. No. 124. Will you describe, as fully as you recollect, the proportions and construction and arrangement of the car Winchester, in her parts?

A. She had three bodies similar to those omnibus bodies, resting on two side pieces—three bodies placed together, resting on two long side pieces. She was placed on two trucks, similar to all eight-wheel cars.

X Q. No. 125. Did the timbers on which the bodies rested extend beyond the bodies at the outer ends; and how were they connected with each other at or near the ends?

A. There was a timber dovetailed in or bolted in at each end, to secure the two side pieces together; and there were rods passed through, from side to side, under the bodies, in different places—in some three or four places. I am not positive about the timbers extending beyond the bodies at the ends; they extended beyond the bodies, undoubtedly, but not far.

X Q. No. 126. Were the wheels in each truck as far apart as in the car Columbus when she was first [first?] put on said road? State, as near as you can, the comparative position of the wheels in the trucks of each of the said cars—the Columbus and Winchester?

A. Well, I don't know that I can give any description of that, for I did not give that strict attention to it.

X Q. No. 127. Can you state who made the Winans friction wheel and box put on the Columbus? and if yea, give his name.

A. I don't know any thing about the friction boxes. I know that there were such things.

X Q. No. 128. Did you make an affidavit, in July, 1852, in the case of Winans against Orsamus Eaton and others, to be used in a suit pending in the United States Circuit for the N. D. of N. Y.? and if yea, did you refer or allude to the eight-wheel horse car referred to in this examination, in the said affidavit?

A. I made an affidavit in July, 1852, I think it was. I referred to all eight-wheel cars built up to 1831.

X Q. No. 129. When, since that affidavit was made, did you first hear the said eight-wheel horse car, of which you have spoken in this examination, referred to, and where and by whom was it spoken of to you?

A. No one. I knew the car when she was built. I heard no one speak of it except here. I knew the car was built, and more than one.

X Q. No. 130. Do you mean to declare, under oath, that the said horse car was not spoken of by any to you, or spoken of in your hearing, since the first of April last, before you appeared here on Monday morning last, when it was first spoken of before me, during the direct examination? State what you mean.

A. I have talked of it with men I fell in company with, about the cars and about this case; men also that worked at the depot.

X Q. No. 131. Will you give the names of all the men with whom you have talked respecting it since the first day of April last?

A. Well, I had some little conversation with Mr. Rupp and Mr. Eichelberger, I believe; that, I believe, is pretty much all. Mr. Gatch, I believe, never mentioned it to me, or I to him, although I have been in company with him. That, I think, is all. I don't recollect any others. I never made it my business to run about and talk about it. All I have said about it is from personal knowledge, in your presence or any body's elses.

X Q. No. 132. Have you not conversed about the said horse car with a Mr. Randall, or with Mr. Hubbell, the Defendant's counsel, at other times than when before the Commissioner? State particularly.

A. I don't recollect; cars were mentioned, but I don't think any particular cars were mentioned. Eight-wheel cars—from 1830 to 1831—eight-wheel cars of different descriptions, were mentioned and talked about, but not horse cars any more than any other.

[Recess until 4 o'clock, P. M.]

*X Q. No. 134.* Do you or not mean to state that your recollection has or has not been refreshed in any, and what way, with reference to the occurrences and things which were done in 1830 and 1831? And if it has been so refreshed, will you state with whom, or in what other way it has been done? State fully.

*A.* It has not, sir; no more than from my personal recollection.

*X Q. No. 135.* Do you mean to state that you have not talked over the particular occurrences and things which you state were done in 1830 and 1831, with W. W. Hubbell, Esquire, or Conduce Gatch, since the first day of April last? State particularly.

*A.* Not at all; more than what questions they asked me I answered as regards the eight-wheel cars.

*X Q. No. 136.* In such conversations who first mentioned or alluded to the eight-wheel horse car, of which you have spoken? and state the way in which it was first spoken of or suggested, and by whom it was spoken of.

*A.* I was asked the question if such a car was built—such a car as the horse and carriage car; and I stated that they were, and that I made the iron work for them.

*X Q. No. 137.* Has the said eight-wheel horse car been always as prominent in your mind as it is now; and was it so when you made the said affidavit heretofore alluded to?

*A.* It was. I have seen them of the same principle from that time up to the present time; it was equally as free, the building of that car, at that time, as it is now, in my mind.

*X Q. No. 138.* Was the said eight-wheel horse car, of which you have spoken as having been used to transport the carriage and horses of the late Ex-President Adams on said road, kept standing for use as an eight-wheel horse car, and so used as an eight-wheel horse or stock car, during the following year; and when were there others afterwards built like it? State how soon, and when after, as near as you can.

*A.* That, I believe, as far as my memory serves, remained standing for that purpose as long as she lasted. I don't know how long that was. I am not certain whether there were any others built that fall, of 1830; but in the spring of 1831 I know there were some built.

*Q. No. 139.* Will you please state how early in the spring, in what month of the spring of 1831?

*A.* I could not state the month. It was somewhere in May or June, along that way.

*X Q. No. 140.* Do you mean to state that you saw Jacob Rupp, Michael M. Glenn, W. O. Frost, and F. A. Gatch, all at work on eight-wheel cars, constructed, intended and adapted to carrying horses? and if yea, did you see them in 1830, or when do you mean to state that you saw them so engaged at work?

*A.* I saw them at various times, some of them at one time and some another. I don't know that I saw the whole of them at work on such cars at one time.

*X Q. No. 141.* Were the eight-wheel stock cars of which you have spoken as having been constructed in 1830 and the spring of 1831, kept for use as eight-wheel stock cars only, and kept standing already to be used for carrying horses, or in what way were they kept for use?

*A.* They were kept in that way. Whenever they were called for they were there ready for use.



*X Q. No. 142.* About how many were kept ready for use in the spring of 1831, as near as you can recollect?

*A.* I can't say for certain; some three or four. I can't say the number precisely.

*X Q. No. 143.* At what distance from the ends of the body were the bolsters placed in the Columbus, when first built?

*A.* I disremember that. I have no knowledge of the distance.

*X Q. No. 145.* What was the diameter of the wheels used in the Columbus when first built? and was the said car Columbus a safe car to be used on said road for passengers, when drawn by steam power and used in trains?

*A.* I know nothing about the diameter of the wheels; it did not belong to me, that. I did not make them, and I never inquired into the size of them. I never heard any complaint of the Columbus. I know of no accident that ever occurred to her, as I ever heard of.

*X Q. No. 146.* Did you ever hear of her getting off the track, or being off the track of said road while in use?

[Objected to by Defendant's Attorney.]

*A.* Never knew of it—never heard of it. I don't believe she ever was off the track accidentally.

*X Q. No. 147.* Upon what scale of proportion is the Exhibit, Defendant's Model K, constructed?

*A.* I could not say anything about that. I am no draftsman or anything like that.

*X Q. No. 148.* How do you know then that it is "as correct a model as possible," as stated by you in your direct examination?

*A.* Because every thing is on that that was on the Columbus, representing every thing that was on the Columbus—that is, when she was first built, that I have reference to.

*X Q. No. 149.* Does it make any, and if any, what difference whether a train of eight-wheel cars are drawn by the body or by the trucks, on a curved road like the Baltimore and Ohio Railroad?

[Objected to by Defendant's Attorney.]

*A.* I could not say, as to that. I have not had experience enough in railroads to tell as to that.

*X Q. No. 150.* To what part of the arrangement now used on the Baltimore and Ohio Railroad, consisting of two trucks connected together for hauling timber, and also in that for hauling cord wood, is the power applied to draw it; is it directly to the truck or to the frame work which supports the load, or to the king bolt on which the bolster turns to allow the truck to follow the curves, or is it to the truck itself? State particularly.

[Objected to by Defendant's Attorney.]

*A.* The most part of them are drawn by the body. There are some timber cars drawn by the perch yet, at the present time.

*X Q. No. 151.* Are they not all drawn by the body, or by a connection directly to the king or pivot bolt?

[Objected to by Defendant's Attorney.]

*A.* Not all drawn by the body now.

*X Q. No. 152.* Is not the following a true copy of the affidavit hereinbefore referred to, as having been made by you, in July, 1852, on the part of the Defendant, in a case brought for the violation of the rights

secured by the letters patent, for another violation of which rights the present suit is brought, viz. ?

*" Circuit Court U. S., Northern District of New York.*

" Ross Winans vs. Orsamus Eaton, et al.

" Leonard Forrest, being duly sworn, says, I am fifty-seven years of age, and reside in the city of Baltimore. I have resided here all my life. I am a blacksmith by trade. In the month of June I went to work for the Baltimore and Ohio Railroad Company, at the outer depot ; this was in 1830. I recollect the timber cars, and also the wood cars, used on the road in 1830. I saw them at that time. The wood cars had two trucks with bolsters and centre pins, and the upper bolsters of the two trucks were permanently connected by strong framing pieces, running lengthwise, and bolted to them. On this frame the wood and other things were placed to be carried. They were identically the same in principle of construction and operation as the eight-wheel wood and freight and passenger cars of the present time, used on the Baltimore and Ohio Railroad. The use of those wood cars has not been discontinued, but they have continued up to the present time. I always understood that they were invented and made by the direction of Conduce Gatch. The timber cars were the same, with the exception that the bolster of the two trucks were not connected by permanent pieces, as was the case with the wood and freight cars ; but the timbers laid from their own weight on the bolsters.

" The next car made upon this principle was for carrying passengers, and was called the Columbus. I made all the iron work for her, except the wheels and axles, and the axle bearings, which were cast iron ; that is, I made the wrought iron work. The centre pins for the bolsters were made by me, at the request of and under the instructions of Conduce Gatch. I know that Jacob Rupp and Francis Gatch worked on the trucks, and he made all the plans of the work that I did. I never received any instructions from Ross Winans, and do not know that he gave any to anybody else on the building of the Columbus. I did not know him at that time at all. The next car built was the Winchester, with three bodies resting on a frame, like the wood cars. I did the iron work for her, except the trucks, and received my instructions from Conduce Gatch. The next car built was the Dromedary, with a body coming down between the trucks. I made a part of the iron work for her, by the directions of Conduce Gatch. The Comet was also built ; I did the iron work for her ; all of these cars drew by the perch. The next cars that I worked for, were the Washington cars, to run on the Washington branch road ; this was in 1835, that I worked for these cars. The construction and operation of these cars, when finished, in the latter part of 1835, was the same as the wood cars of 1830, and the Columbus, Winchester, and Dromedary and Comet ; with this difference as to drawing, that they drew by a coupling at the middle of the end of the body, instead of by the perch. I always understood that Conduce Gatch was the inventor of the wood cars and the car Columbus, and I believe that he was ; and I also understood that Jacob Rupp invented the mode of drawing by the middle of the end of the body that was used in the Washington cars, and also on the freight cars made by Rupp. He contracted to build a hundred and more cars, for the Baltimore and Ohio Road, in 1835, and he proposed the mode of drawing the cars to Mr. Gillingham, the Superintendent, instead of having two chains, one from each corner of the car. I have no interest in this suit.

" Witness, JOHN HANAN."

his  
" LEONARD X FORREST."  
mark.

*" United States of America, District of Maryland, ss.*

" Be it remembered, that on the fifteenth day of July, in the year of our Lord, one thousand eight hundred and fifty-two, before the subscriber, a Commissioner of

DEPOSITION OF LEONARD FORREST, FOR RESPONDENTS. 601

the Circuit Court of the United States, for the Fourth Circuit, in and for the District of Maryland, personally appeared Leonard Forrest, and makes oath on the Holy Evangely of Almighty God, that the matters and things set forth and stated in the foregoing deposition is true, to the best of his knowledge and belief."

"JOHN HANAN, Comm'r."

State fully and particularly, and in what respect it is not correct and true.

A. I don't see any thing incorrect about it. There is nothing incorrect about it.

X Q. No. 153. Was not the said affidavit copied into this deposition from a printed copy, voluntarily handed to the Commissioner by the counsel for the Defendant?

[Objected to by Defendant's Attorney, as he told the Commissioner at the time he did not know it to be a true copy, and did it simply for the convenience of the Commissioner, in copying off the printed matter.]

A. No, sir; it was handed to him in writing; at all events, when I put my mark to it it was in writing, and the Commissioner had it in his hands when I put my mark to it. I saw the Commissioner, in this case, copy something from a book in the possession of Mr. Hubbell, but as I cannot read, I do not know whether it was the copy of the affidavit or not; but the affidavit I made and put my mark to, was in writing, not printed.

Thereupon adjourned until to-morrow morning, at 10 o'clock, A. M.

On this 16th day of June, 1853, appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, Charles D. Gould, Esquire, Attorney for the Plaintiff, and the witness, Leonard Forrest, and thereupon I further proceeded with the deposition of the said Leonard Forrest, as follows, to wit:

X Q. No. 154. How do you know that Jacob Rupp invented the mode of drawing cars on railroads, by an attachment to the body of the car? State all you know about it.

A. Well, I know nothing more than he stated it. I heard him say he invented it.

X Q. No. 155. How do you know that it was originally intended to draw the cars built by Mr. Rupp, in 1835, for use on said road, by "chains, one from each corner of the car," as stated by you in said affidavit? State fully.

A. Because Mr. Gillingham took me out to one of the cars, and asked me the best plan of making hooks, to be bolted on the side of the car, and told me, himself, that they were to be connected with chains.

X Q. No. 166. Did he also state that they were not be attached to each other in the centre of the body?

A. He did not say anything in respect to that.

X Q. No. 167. Had you not made couplings suitable for the attachment of cars in a train, by the body, consisting of a bar or flat piece of iron, with a hole in each end of it, in the year 1831, and in the following years, up to 1836?

A. No, I never made any such. There were none such used in 1831.

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X Q. No. 168. Will you describe those made by you, in 1832, for use on cars on said road?

A. I made none in that year. I did not work on any of that kind of work.

X Q. No. 169. Will you look at the paper now shown you, and which is in the following words, viz :

	“ BALTIMORE, January 31st, 1832.
To making eleven sets of irons for breaks, at 70 cents each,	\$7 70
To making 36 couplings, a 25 cents each,	9 00
To one month's work for boy,	6 00
	<hr/> \$22 70

Received payment,

His  
LEONARD X FORREST,  
Mark.  
F. A. GATCH.”

And after having it read to you by the Commissioner, state whether it is not a voucher rendered by you to Conduce Gatch, as “amount of bill for night work, by Smith and helper,” and returned by said Gatch as a voucher, with his statement of items, for which he had expended the money of the company, in January, 1832?

[The Defendant's Attorney objects to this question, as the couplings of four-wheel cars are irrelevant to this suit. Second, that the Plaintiff's Attorney neglected to furnish to the Defendant's Attorney all of the papers obtained from the files and records of the Baltimore and Ohio Railroad, by Ross Winans or his Attorney, for the inspection of Defendant's Attorney, of which this, from the question put, appears to be one. And the Defendant's Attorney now repeats the request to Plaintiff's Attorney, to furnish him with all such papers for his inspection, and requests that this be filed as an Exhibit in the case.

And also objects to this paper, as of course it is not in the handwriting of the witness.]

[To which the Plaintiff's Attorney replies, that the witness to whom the interrogatory is addressed, having declared himself unable to write, which fact appears from his having, in all the papers presented to him, made his mark, instead of writing his name, and as the person who witnessed the signature on said voucher, has been declared to be dead, by the witnesses brought by the Defendant, and as the Defendant's Attorney has also declined to produce Conduce Gatch, who assumed the correctness of the said voucher—which belongs to the said Baltimore and Ohio Railroad Company, which he, Complainant's Attorney, is not at present at liberty to place beyond his control; he therefore presents the subject of the interrogatory to the witness, in the above form.

The Defendant's Attorney replies that Conduce Gatch has been examined, and discharged, and the Plaintiff's Attorney failed to produce this and other papers in the possession of the Plaintiff or his Attorney, during said examination, and when requested to produce the same.]

A. It strikes me I did some night work for Mr. Gatch. I disremember the kind of work: it strikes me it was some kind of brake



irons. The couplings, I am well aware what they were; they were three links connected together, just three links of chain.

X Q. No. 170. Do you deny the correctness of the said voucher, as read to you? if yea, state in what the error or inaccuracy consists. [Objected to by Defendant's Attorney.]

A. I don't pretend to deny it; it may be correct to the best of my knowledge.

his  
LEONARD X FORREST.  
mark.

LEVIN GALE, *Com.*

And the said Leonard Forrest being re-examined on behalf of the Defendant, further says:

Q. No. 171. When the affidavit made by you, on the 15th of July, 1852, was being written, were you asked any thing about the transportation of carriages and horses on said railroad? and are you of yourself sufficiently acquainted with the law suit to know what facts were to be proved in it?

A. There was nothing asked me about the horse and carriage car. I know nothing about the nature of the case or suit at all.

Q. No. 172. Were you ever examined as a witness in a law suit about the patent of Ross Winans, or in any other law suit before the present time, and the other suit in which the affidavit was given?

A. Never before in my life, sir.

his  
LEONARD X FORREST.  
mark.

LEVIN GALE, *Com.*

And the said Leonard Forrest, being further cross-examined on behalf of the Plaintiff, further says:

X Q. No. 173. Did you not converse with the person who drew the said affidavit, before he commenced to write it? or did he begin first asking you a question, and taking down your answer to that before he spoke again relative to it, or in what way did he proceed?

A. Yes; Mr. Hubbell, the first time I saw him, he asked me questions, and wrote down the answers as I gave them to him.

X Q. No. 174. Did you answer his questions relative to the contract of Rupp, before he commenced writing, or putting down your name and residence?

A. Not that I remember, sir. I remember this much; he told me not to say any thing or answer about any questions until he first asked me; and that was the beginning of the conversation.

X Q. No. 175. Will you look at the paper now handed you, marked "Plaintiff's Exhibit No. 8, and state whether it does not nearly represent a kind of coupling made by you, for connecting cars, in 1831 and 1832, not meaning to give the proportions of the coupling, but an idea of its shape, and the mode in which it was intended to be used? and if not, state in what it differs.

A. I never made one like that, or any thing in proportion. The difference at that time was, they used a simple link to drop over the drawing pin; that was for the burthen cars, and I had nothing to do with them at that time. They had to have them at that time to allow the two ends of the perches to strike together, to prevent them from breaking the drawing pins off. I made very few of those links;

they were most all of them made at Mr. Gillingham's shop, all that rough work.

his  
LEONARD X FORREST.  
mark.

Thereupon adjourned until tomorrow morning, the 17th day of June, 1853, at 10 o'clock, A.M.

On this 17th day of June, 1853, appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, Charles D. Gould, Esquire, Attorney for the Plaintiff, and John M. Eichelberger, a witness produced on behalf of the Defendant.

And the said John M. Eichelberger (being of sound mind) being by me first carefully examined and cautioned, and duly sworn, according to law, to testify the whole truth, and being examined on behalf of the Defendant, makes oath, depose, answer, and saith, as follows, to wit:

#### DEPOSITION OF JOHN M. EICHELBERGER.

**Q. No. 1.** Please state your age, residence, and trade or occupation?

**A.** I am forty-five years old; my residence is in Lexington street, beyond Fremont street, I don't know the number, in the city of Baltimore; I am a painter by trade; I served my time at that business.

**Q. No. 2.** How many years did you pursue your trade or business as a painter?

**A.** Well, I went to the trade when I was eighteen years old, and I have been working at it all my life until the last four or five years. I work at it some now, but I don't carry it on as I have done.

**Q. No. 2.** Did you or did you not work for the Baltimore and Ohio Railroad Company? and if you did, what kind of work did you do for that company, and when did you commence to work for them?

**A.** I did work for them; I worked at painting cars for them. I commenced in June, 1830. I painted other things beside cars; I painted a warehouse for them, and other things, pretty much all they had to do of that kind. I was the only painter they had employed at that time.

**Q. No. 4.** When you were employed in the year 1830, what kind of cars did you see upon the said Baltimore and Ohio Railroad that you recollect of, during or in said year 1830? State how many wheels they had; and for what purposes, if any, they were used in that year.

**A.** The first cars that I have any recollection of were some cars that were built there by the hands, Gatch and others among them. They were intended to haul passenger passenger [?] cars. I hardly know what to call them; they were box concerns intended for passengers. Then there were a great many burthen cars made, called platform cars, and box cars, to haul dirt and other things; they hauled iron rails on them. I don't recollect of any that had more than four wheels just at that time.

**Q. No. 5.** Did you paint the four-wheel cars of which you speak?

**A.** Yes, sir, I did.

*Q. No. 6.* What other cars did you paint for the Baltimore and Ohio Railroad Company?

*A.* I painted all the cars they had, all they built.

*Q. No. 7.* Will you name them, or identify those that you painted for the said company, as far as you can recollect?

*A.* I don't know how to answer that; burthen cars, pretty much all; some passenger cars; they were for different purposes.

*Q. No. 8.* Had the passenger cars names given to them generally; and by what names were they called, so far as you recollect?

*A.* The first car, that I know that had a name, was the Pioneer. There was a little basket car there the President had; that was called the Basket Car. The Columbus was the next one that had a name.

*Q. No. 9.* Who painted the Columbus?

*A.* I painted her.

*Q. No. 10.* How many wheels had the Columbus? Describe her construction, as well as you can.

*A.* She had eight wheels. She was a large car; she would carry a hundred or a hundred and fifty passengers; I don't recollect now which.

*Q. No. 11.* Describe her construction, as well as you can.

*A.* She had a couple of trucks under her, made pretty much like the burthen cars, hung up on bolsters, and settees on top and inside, steps at the end, and an iron railing, called a baggage railing, around the top.

*Q. No. 12.* Do you or do you not recollect of seeing other eight-wheel cars on the said Baltimore and Ohio Railroad, whose body framing or body was not painted? and if you do, state for what purposes they were used.

*A.* There were cars, the bodies of them for carrying horses, carriages, cattle, hogs, and other things of that description.

*Q. No. 13.* How many wheels had they, and how were they constructed? describe them as fully as you can.

*A.* I don't recollect of any of them having more than four wheels, them cars. They had frames, strips put around, with large gates at the end, to let hogs, &c., up, hogs and horses, and to haul up carriages.

*Q. No. 14.* Do you or do you not recollect of seeing eight-wheel cars on said road to carry cord wood?

*A.* I do recollect seeing eight-wheel cars.

*Q. No. 15.* Is your recollection very distinct as to any cars other than those you worked on or painted?

*A.* Yes; I recollect the coach cars that were brought there; the Pioneer, the first coach car that I ever recollect of coming there.

*Q. No. 16.* What other cars have you a distinct and positive recollection of, which you did not paint?

*A.* Them are all the cars that I recollect any thing about—them coach cars that I did not paint. They were painted when they came there. They were built somewhere else, I don't know where.

*Q. No. 17.* Do you recollect about the construction of the car Columbus, which you painted? and if so, examine the model marked "Defendant's Exhibit K," and say whether that is or is not a correct model or representation of the said car Columbus, and state, if you recollect, at what time the said car was constructed and finished?

*A.* That is just the same, exactly, as the Columbus. She was built,

I think, in 1831, in the spring. Her first trip that she ever run was, I think, about the 1st of July. I think it was about the first; I don't recollect the day.

*Q. No. 18.* Did you see any drawings while the said car Columbus which you painted was being built? if so, where did you see them, and what did they represent, and who had the drawings — where were they?

*A.* I saw a drawing of the body; it was in Oliver Cromwell's shop, where the body was building. Oliver Cromwell had them in his shop.

*Q. No. 19.* Did you or did you not examine the said drawing, which Oliver Cromwell had, to see what was on it, or what it was?

*A.* Well, I looked at it often to see it — it was just a plain drawing of the body, shaded yellow — just the sketch of a body.

*Q. No. 20.* Were there any trucks or running gear on the said drawing when you examined it?

*A.* There was not. I never saw any to it.

*Q. No. 21.* Was there any railing on top of the body part of said drawing when you examined it?

*A.* No; there was no railing on it while I saw it, not while he was at work on it building the body; I did not see any railing on it.

*Q. No. 22.* Will you look at the drawing now handed to you, marked Defendant's Exhibit G, and say if you saw at any time a drawing like that, and what it represents? State fully.

*A.* No, I have seen no drawing exactly like this. The drawing he worked by was not exactly like this.

*Q. No. 23.* In what way, if any, or in what exact particular, does that drawing, Defendant's Exhibit G, differ from the drawing which Oliver Cromwell worked by in the building of the body of the car Columbus, which you painted?

*A.* It had panels colored all along here, painted yellow; these are all white.

*Q. No. 24.* Do you mean the panels along the side between the uprights, and near the bottom rail, were painted yellow in the drawing Cromwell had, where they are white in this Exhibit G?

*A.* Yes; I mean these lower panels along here were yellow.

*Q. No. 25.* With the exception, then, of the lower panels being painted yellow, where this Exhibit G is white between the uprights, is or is not the said Defendant's Exhibit G like the said drawing which you saw Cromwell have? If there is any other exact difference, state it.

*A.* Well, I don't know any other difference than that; it looks something like it as well as I can recollect.

*Q. No. 26.* Who made the trucks or running gear of the car Columbus, which you painted, and which was first put in use about the 1st of July, 1831?

*A.* Well, they were built in Gatch's shop, by his direction, by Francis A. Gatch and Jacob Rupp. They did the work on them, I think, as well as I recollect.

*Q. No. 27.* Do you recollect of seeing any drawing from which Jacob Rupp and Francis Gatch worked, in building the said trucks of the said car Columbus, which she had under her about the first of July, 1831?

*A.* Well, they had, laid down on a board; I don't know whether you



would call it a drawing or not; all carpenters and mechanics make such laying down on a board. All bosses, when they want to show a hand what they want done, lay it down on a board, to give them the dimensions, &c. to give them an idea of what they are to make, and they call it a drawing board. You might call it drawing off; they draw it off in their way.

*Q. No. 28.* Was the car Columbus, which you painted in 1831, altered? and if so, when and where, and in what respect was she altered, as far as you recollect?

*A.* She was altered down at the Charles Street Depot, at the corner of Charles and Camden Streets. The stairs were made to go up inside instead of the steps they had to go up outside; then I think, as well as I recollect, there were rods fixed up for an awning to go over, and then wire worked in like netting around the top, to prevent persons and children from falling off the top; that was what I suppose it was for. These alterations were made some time after she was built; I don't recollect exactly when.

*Q. No. 29.* Who painted the steps that went up inside when the said car Columbus was altered?

*A.* I painted them, sir.

*Q. No. 30.* Did you paint any other part of said car Columbus when she was altered at the Charles Street shop? If so, what part? And state if you recollect of any other alterations, or whether the said car Columbus had or had not, new trucks and Winans friction wheels and boxes put under her when she was altered at said shops.

*A.* I don't recollect of painting any thing but the steps when they were altered and put up inside; and I don't recollect whether there was anything done to her running part or not.

*Q. No. 31.* Was there any other person painted the said car Columbus, or any part of her when she was altered in the Charles Street shop, that you recollect of?

*A.* Not that I recollect.

*Q. No. 32.* What kind of materials were the uprights of the awning made of that were put on the said car Columbus when she was altered at said Charles Street shops? and who painted them?

*A.* It was a light iron frame, made to go round, of light iron. I don't recollect whether I painted them or not. I might have painted them, but I have no recollection of it.

*Q. No. 33.* Will you look at the drawing, marked "Plaintiff's Exhibit No. 4," and state if any persons called upon you with a smoked drawing, similar to, or upon the same plan as that Exhibit, and if so, state when and where, as near as you can, they so called, who they were, and what you told them about said smoked drawing? state fully.

*A.* Oliver Cromwell and two other gentlemen called at my stable, in German street, and represented that to be the drawing that he worked by when he built the Columbus—the old drawing. I told him that the drawing he worked by had no running part to it, nor no net work around the top; I told him the net work was put on down at the Charles street shop, long after the car was built, and asked him if he did not recollect where that net work was put, and he said he did not know about that. Moreover, I told him I did not think it had friction boxes on when she was first built; I thought she had plain boxes.

**Q. No. 34.** Had or had not the car Columbus, when first built, in the spring of 1831, and painted by you, running gear, or trucks with friction wheel boxes, or boxes like the said Plaintiff's Exhibit No. 4, or a railing on top like the Plaintiff's Exhibit No. 4, on her; or on her on or about the 1st of July, 1831, when first built?

**A.** I don't recollect about the boxes exactly. I was always under the impression she had plain boxes when first built. She never had a railing on top like that; that is a wooden frame. She had a net work of iron, and frame for an awning on top, when she was altered. When first built she had small baggage rods—two little rods, I think, running around her.

**Q. No. 35.** Who put the panes of glass in, or glazed the panes of glass, in the said car Columbus, painted by you, along the sides of the car, above the sliding windows, and what was the size of the panes of glass?

**A.** I put them in; the size I don't recollect exactly; they were small glass.

**Q. No. 36.** About what size were the said glass?

**A.** They must have been eight by ten, or seven by nine, or something like that; they were quite small glass. I don't recollect exactly.

**Q. No. 37.** How many panels were in the door of the said car Columbus, painted by you, and how many panels are in the doors shown on the said Plaintiff's Exhibit No. 4?

**A.** There were six panels in the door. Two doors, and six panels in each; what we call a six panel door. There are two panels shown in Plaintiff's Exhibit No. 4, in each door.

JOHN M. EICHELBERGER.

LEVIN GALE, *Com.*

And the said John M. Eichelberger, being cross-examined, on behalf of the Plaintiff, further says:

**X Q. No. 38.** Was the painting work on cars, as stated to have been done by you, in 1830 and 1831, done while the cars were standing on the railroad track about the shops and at said Mount Clare depot, or was it all done in the shops, and did you have a shop, in which cars were painted, separate from that in which they were constructed? state particularly as to each.

**A.** These cars that were new, that I mentioned, were on the track, and about the yard, and I painted them out on the track, or about the yard; they were passenger cars. The burthen cars, they were painted in the work shop where the wood work was built; there was no paint shop.

**X Q. No. 39.** Do you think you saw, and had knowledge of all that was done publicly at and about the said shops, during the year 1830, and the early part of 1831? state fully.

**A.** There might have been a great many things done there that I knew nothing about. What I painted, the cars and such things, I saw, of course.

**X Q. No. 40.** Have you any knowledge of the manner in which Oliver Cromwell obtained the drawing, from which the car Columbus was built, which you have spoken of as being in his possession? state what knowledge you have respecting it.

A. I don't know where he got the drawing from. I saw it there, and saw him work by it.

*X Q. No. 41.* Have you not made a statement relative to the manner in which he, Oliver Cromwell, came by said drawing? and, if yea, will you repeat such statement, if you have made such a one?

A. I think, to the best of my recollection, that Winans brought the drawing there; whether he made it or not I can't tell. They told me at the time—Cromwell, I think, said that he brought that drawing there for the bar.

*X Q. No. 42.* Do you mean to refer to Ross Winans, the Complainant, in your answer to the last question?

A. Yes: that Winans gave Cromwell the drawing.

[Recess till four o'clock, P. M.]

*X Q. No. 43.* Did the said car Columbus, when put to use on said road, in 1831, have a single panel filling the entire width of space between the windows and the sill on the side of the body of the car? and how many panels in the length were there between the doors on each side?

A. It was laid off in panels, but I am not certain how many panels there were. It was laid off in panels, with mouldings in between, like this on model K; but how many panels there, whether three or four, or more, I cannot recollect. Of course, when the sides were put on they were all in one, it was half-inch poplar, and the mouldings were put on, which laid the side off in panels. The mouldings were put across, to lay it off in panels. It was one panel in depth from the sliding windows down.

*X Q. No. 44.* At what distance from the ends of the body were the bolsters, under which the trucks were placed, or the pivot bolt connecting the body and the trucks?

A. I don't know the distance. I had nothing to do with distance or dimensions, or taking the size of the car; all I had to do was to paint it.

*X Q. No. 45.* How long did you continue as the painter of cars, in the service of the said company, working at cars out of doors and in the shops?

A. I worked for the company four years, by the day, at a dollar and a half a day. Then they thought the work was costing them too much, and they gave the work out to the hands by the piece work; then I contracted for the work as they wanted it done, and did the work by the job, as it is called. I worked for them in that way hard on to [?] year, at cars and other things they wanted done. I had to paint, repaint old cars, and do many different kinds of jobs of painting.

*X Q. No. 46.* How long were you, alone, as a painter of cars in the service of the said company?

A. Well, I was alone all that time; except when I had more than I could do, I would go and get a hand to help me; but I was the only painter they had permanently employed all the time. I was there all the time, for the four years that I worked for them by the day, except what few days I lost.

*X Q. No. 47.* When was the principal part of your work done?

A. Well, I commenced at the Mount Clare station; I worked there

until they moved the shop down to Charles street; then I went down there and worked with them until the change took place, in giving out the work by piece; when they gave the work out by the piece I worked sometimes at the Charles Street shop, sometimes at the Mount Clare station, and on cars on the road near there. Old cars would come in the train, and I would go out there and paint some two or three while they were in the train, and let them go off at once. Sometimes there would be fifty or sixty new cars scattered about the fields, near the Mount Clare station, and I would go and paint them wherever they were.

X Q. No. 48. Did you paint the cars for carrying stock, or were they left unpainted?

A. They were painted; I painted them. I painted pretty much all about the place, in the shape of cars; I had nothing else to do but paint.

JOHN M. EICHELBERGER.

LEVIN GALE, *Com.*

And the said John M. Eichelberger being re-examined on behalf of the Defendant, further says:

Q. No. 49. Did you see Ross Winans give Oliver Cromwell the drawing or sketch of the car body, in 1831, from which Cromwell worked on the Columbus, or did Cromwell tell you at that time that Ross Winans gave him the said drawing or sketch?

A. I did not see Ross Winans give him any drawing; but Cromwell told me, at least I always so understood from Cromwell, that Winans brought the drawing there; but who made it I never knew. I recollect well when Gatch sent for Cromwell, and employed him to work; he was the only coach maker about the place then. They employed him at first to mend shafts.

Q. No. 50. What cars for carrying stock did you paint, and what kind of stock did you see carried in them, and when did you see it carried?

A. I painted those cars I told you of before. Frames put on, trussells, as you call them. Long sills put on, framed up with strips, open like. They used to call them hog cars; they used to shower them in by the cord. They used to bring in a great many hogs, cattle, sheep, horses, and sometimes horses and carriages. I can't recollect exactly the time it was. I suppose, though, it must have been 1831.

Q. No. 51. How long were the long sills of the body that the open work was put on, or do you know the mechanical construction of the said cars with long sills and frames put up?

A. I don't know the exact length of them; they were long, I suppose; some eighteen or twenty feet. They used to take two of these trucks, as you call them, and put under them to make a hog car; they could not make one of them with one truck; they were long, to carry hogs and horses, and such things, and would tip up at one end if there was but one truck under them. As well as I recollect, there was, I think, orders given to Gatch to make a dozen of them at one time.

Q. No. 52. Where was the depot that you painted, was it or was [?] not at Ellicott's Mills?

[Objected to by Plaintiff's Attorney.]

A. I painted a warehouse at Ellicott's Mills for the company; they



called it a warehouse; it was to receive goods in; I suppose you might call it a depot.

JOHN M. EICHELBERGER.

And the said John M. Eichelberger, being further cross-examined, on behalf of the Plaintiff, further says:

*X Q. No. 53.* At what time, and during what year was the order you speak of given to Mr. Gatch to make a dozen hog cars at one time? state particularly.

*A.* Well, I don't know exactly at what time. It must have been in the fall of 1830 or the fall of 1831, because hogs are generally brought in in the fall.

*X Q. No. 54.* Reflect a moment. Would a road of the length of the said Baltimore and Ohio road was, in the fall of 1831, require a dozen stock cars to carry hogs, in addition to what was previously in use, to enable it to do the business of bringing hogs to the Baltimore market at that time?

*A.* They brought them from Frederick; there were a great many brought from Frederick; I don't state certainly that was the time; I am not certain about the time.

*X Q. No. 55.* Will you swear that you saw a stock car in use on said road, having eight wheels, in the year 1831?

*A.* No, I would not swear it, because I told you before I was not positive about the time. It might have been a little later than that. I am not positive about the time; it might have been later.

*X Q. No. 56.* Who gave the order to Mr. Gatch for the dozen hog cars of which you have spoken, for use on said road?

*A.* It must have been George Brown; he had all to say there, he and his father, Alexander Brown; they were there all the time.

*X Q. No. 57.* Does the drawing, marked Defendant's Exhibit G, represent the body of the car Columbus, as she was built in 1831?

*A.* It represents the frame-work of it.

*X Q. No. 58.* Does it represent the number of panels she had on a side when built? State in what particulars it resembles it, and in what it differs.

*A.* As I told you before there were no panels. The drawing shows the frame-work; it does not show any panels here.

*X Q. No. 59.* Does the said drawing, marked Defendant's Exhibit G, show such frame-work as was used in the car Columbus, or does it show anything more than a very long body, about double the length of the car bodies of that time, and then in use on the road?

*A.* It shows the frame-work of the Columbus just as she was framed before she was finished, the way I look at it.

JOHN M. EICHELBERGER.

Sworn to and subscribed before  
LEVIN GALE, *Com.*

Thereupon adjourned until tomorrow morning, at 10 o'clock, A. M.

On this 18th day of June, 1853, appeared before me, William W. Hubbell, Esq., Attorney for the Defendant, Charles D. Gould, Esquire, Attorney for the Plaintiff, and Thomas Murphy, the witness heretofore examined.

And the said Thomas Murphy, being recalled and further examined on behalf of the Defendant, further says :

### DEPOSITION OF THOMAS MURPHY.

Q. No. 1. Will you please produce the file of the American and Commercial Daily Advertiser, from the office of said paper for the latter half of the year 1830, and turn to the said paper thereof, printed and published December 18th, 1830, and read the heading and date thereof, and turn to the second editorial column of the same, and find an article commencing with these words: "We learn from the Gazette that Ex-President Adams and his lady," and read the whole of said article to the Commissioner; and after having done so, state whether the same was or was not printed and published in the said paper of December 18th, 1830?

[Objected to by Plaintiff's Attorney.]

A. "American and Commercial Daily Advertiser. Baltimore, Saturday morning, December 18, 1830." I have got the article.

"We learn from the Gazette that Ex-President Adams and his lady, Sir William Campbell, and several other strangers, accompanied by the President and some of the Directors of the Baltimore and Ohio Railroad Company, made an excursion up the road yesterday morning. Mrs. Adams's carriage, with the horses, was, we learn, placed upon a trussell, attached to one of the railroad cars, and taken as far to [?] as the Relay House, at Elk Ridge Landing, from which place it proceeded to Washington, by the turnpike road.

"We understand that the Railroad Company have prepared several of these trussells, by which either wagons or pleasure carriages may be transported along the road without being unloaded, or putting the passengers to the inconvenience of getting out of their own carriages. This is certainly a new and important facility which this admirable system is capable of affording."

That is the whole of the article.

It was printed and published in said paper on the 18th of December, 1830. THOS. MURPHY.

LEVIN GALE, *Com.*

[Recess until [until?] four o'clock, P. M., to allow the Plaintiff's Attorney time to examine the volume produced, for the purpose of cross-examination.]

And the said Thomas Murphy being cross-examined on behalf of the Plaintiff, further says :

X Q. No. 2. Will you turn to No. 9,869 of said paper, published December 16, 1830, and find on the last column of the second page, a paragraph relating to the "Honorable John Quincy Adams," and read the same, and state what it means?

[Objected to by Defendant's Attorney.]

A. "The Honorable John Quincy Adams, Ex-President of the United States, arrived last evening from New York, and took lodgings at Renshaw's United States Hotel.—*Phil. U. S. Gaz.*, Dec. 15."

It is merely announcing at Philadelphia the arrival of the Ex-President of the United States on that day, that is, the 14th of December, 1830.

*X Q. No. 3.* Was that published by you in the paper of the date above indicated, and were you then connected, and has your connection continued ever since with the said paper?

A. It was published by us in our paper, on the 16th of December, 1830. I was then connected with said paper, and my connection with it has continued ever since.

*X Q. No. 4.* Will you now turn to No. 9,860 of said file, published December 6th, 1830, and state whether you do or not find on the second page of said paper, an editorial paragraph in the following words, viz :

"We have frequently had occasion to speak of Winans's friction wheels, which have been so advantageously introduced in the wagons and coaches on the Baltimore and Ohio Railroad ; and although it was believed from the first that this novel manner of applying friction wheels, was decidedly superior to any other heretofore discovered, yet it was by a course of experiments, alone, that the merit of the invention could be fully tested. Very satisfactory evidence in their favor had been offered, from time to time, since they were first adopted ; but the most conclusive demonstration of their great value was exhibited on Friday, in an examination made in the presence of several gentleman, at the depot of the Baltimore and Ohio Railroad. One of these wagons, that had been employed daily in the transportation of burdens of three to four tons, on the railroad, and have traversed a distance of sixteen hundred miles, was selected for the purpose. The several parts being laid open to view, the result was highly satisfactory, as will appear from the following statement.

"The ends of the main axle-trees, which revolve *within* the periphery of the friction wheels, and sustain the whole weight of the carriage, were not perceptibly worn, the file marks not being obliterated. The journals or gudgeons, of the friction wheels, did not appear to be at all worn, but had acquired a remarkable smoothness. The boxes, or bearings, in which they revolve, had suffered no abrasion, whatever, but exhibited a highly polished surface. The inner periphery of the friction wheels, which revolve around the end of the main axles, presented a smooth and equal surface throughout, and no apparent wear or abrasion could be perceived.

"From the facts above stated, it is evident that waggons or coaches of this construction, besides possessing other advantages of great importance, will not require repairs for a number of years ; they will also consume much less oil, it having been ascertained that one oiling will suffice for three hundred miles ; whereas the Railroad waggons in England, of the usual construction there, require a profuse supply of oil every ten or fifteen miles."

And if yea, was such paragraph published as editorial in the paper of the date indicated ?

[Objected to by Defendant's Attorney.]

A. I do find such a paragraph ; it was published as editorial in the paper of the date indicated.

*X Q. No. 5.* Will you now turn to No. 9,780 of said file, dated Wednesday morning, September 1st, 1830, and state whether you do or not find, on the second page of said paper, the following words, viz :

"The following letter from Mr. ROSS WINANS, to the President of the Rail Road Company, on the subject of the performances of Cooper's Locomotive Engine, on Saturday last, cannot fail to be perused with interest and gratification by our readers generally. It is copied from the Gazette of Monday.

"Baltimore, August 28, 1830.

"Philip E. Thomas, Esquire, President of the Baltimore and Ohio Railroad Company.

"Sir: The performance of the working model, or experimental Locomotive Engine of Mr. Cooper, has been such to-day, as to induce me to attempt a hasty comparison of its dimensions and performances with some of the late celebrated English locomotives, having witnessed the grand locomotive exhibition at Liverpool, in October last, for the £500 prize, and many other interesting experiments by the Novelty and Rocket, since that time. As Mr. Cooper's engine has been got up in a temporary manner, and for experiment only, and has been on the road but a few days, it will be no more than justice to make the comparison with some of the early experiments of the English engines. I have therefore selected the experiment of the Rocket, in October, on the result of which the premium of £500 was awarded to Mr. Stevenson, its builder, for having produced the most effective locomotive engine, &c. The Rocket is professedly an eight horse power, when working at a moderate speed; but when working at high velocities, she is said to be more than eight horse power. Its furnace is two feet wide, by three feet high; the boiler is six feet long and three feet diameter. The furnace is outside the main boiler, and has an external casing, between which and the fire place, there is a space of three inches, filled with water, and communicating with the boiler. The heated air from the furnace is circulated through the boiler, by means of twenty-five pipes, of two inches internal diameter. It has two working cylinders, of eight inches internal diameter, and fifteen inches in length each, or thereabouts. The road wheels, to which the motion is communicated, are four feet eight and a half inches diameter. Mr. Cooper's engine has but one working cylinder, of three and a quarter inches diameter, and fourteen and a quarter inches stroke of piston, with a boiler proportionately small, or nearly so. The wheels of the engine, to which the motion is communicated, are two and a half feet in diameter, making it necessary to gear with wheel and pinion to get speed, by which means a considerable consumption of power is experienced.

"You will perceive, by the foregoing, that the capacity or number of cubic inches, contained in the Cylinder of Mr. Cooper's engine, is only about one fourteenth part of that contained in the two cylinders of the Rocket, consequently it can only use one fourteenth the quantity of steam under the same pressure, when each engine is making the same number of strokes per minute, which is nearly the case when the two engines are going at equal speed, on the road. The total weight moved, in the experiment above alluded to, by the Rocket, including her own weight, was seventeen tons, on the level road, at an average speed of twelve and a half miles the hour, thereby exhibiting, (agreeably to Mr. Vignoles's late tables of the power of locomotive engines,) a little less than a six horse power. Mr. Cooper's engine has to-day moved a gross weight of four and a half tons, from the depot to Ellicott's Mills, and back, in the space of two hours and ten minutes, which, as you are aware, the distance being twenty-six miles, gives an average speed of twelve miles to the hour. As the engine returned with its load, to the same point from whence it started, the acclivities and declivities of the road were of course balanced, and at least as much time and power (if not more) were required to traverse the whole distance, as would have been on a level road; therefore (agreeably to the aforesaid tables of Mr. Vignole's) Mr. Cooper's engine exhibited an average force, during the time it was running, of 1.43 horse power, or nearly one and a half, which is more than three times as much power as the Rocket exhibited during the experiment above described, in proportion to the cylindrical capacity of the respective engines. This, no doubt, originated, in a considerable degree, from the steam being used in Mr. Cooper's engine, at a higher pressure than in the Rocket; we are, however, not able to come to any very correct conclusion, as to what extent this cause prevailed, (Mr. Cooper's steam gauge not being accurately weighed) which prevents a more minute comparison being made.



"It may be said that subsequent practice and experience with the Rocket, have enabled her constructor to produce more favorable results, which is, no doubt, the case ; but we have every reason to expect a similar effect with regard to Mr. Cooper's engine, judging from what we have witnessed, each exhibition of its power being as yet, an improvement upon the one that preceded it. It is, however, too small and too temporary in its construction, to expect a great deal from it, the friction of its parts, the heat lost in a small engine being much greater in proportion to the power, than in a large one, but to-day's experiments, must, I think, establish beyond a doubt, the practicability of using locomotive steam power on the Baltimore and Ohio Railroad, for the conveyance of passengers and goods, at such speed, and with such safety, (when compared with other modes) as will be perfectly satisfactory to all parties concerned, and with such economy as must be highly flattering to the interests of the company. It has been doubted by many, whether the unavoidably numerous short curves on the line of your road and inclined planes, would not render the use of locomotive power impracticable, but the velocity with which we have been propelled to-day, by steam power, around some of the shortest curves, (to wit, from 15 to 18 miles per hour,) without the slightest appearance of danger, and with very little if any, increased resistance, as there was no appreciable falling off in the rate of speed, and the slight diminution in speed in passing up the inclined planes, some of which were nearly 20 feet to the mile, must, I think, put an end to such doubts, and at once show the capability of the Baltimore and Ohio Railroad, to do all, and much more than was at first anticipated or promised by its projectors and supporters."

"This admirable effect of turning curves of 400 feet radii, at fast speed, with very little, if any, increased resistance, I believe to be new in the history of railways, or at least, that it is brought to a greater degree of perfection, on the Baltimore and Ohio Railroad, than on any other. It results from the judicious and scientific construction of the tread of the main wheels, (introduced by Mr. Knight, your principal engineer,) by combining the cone and cylinders, which expedient, as far as I know, has never been attempted in Europe.

"In the formation of the tread of the main wheels, each possessing their peculiar advantages, and operating much more beneficially when connected, than when used separately, the main head being cylindrical, offers less resistance to motion, (when moving in a right line,) than any other shape. That part of the face of the wheel which is assigned for play on the rail, is made conical, and is only called into action when necessary, and to such an extent only, as to correct the course of the car, and all the cone being placed immediately between the inside edge of the rail and the flange of the wheel, it is evident the flange can never come into contact with the rail, until the whole cone is brought into action, (which is far from being the case with the English coned wheel,) the extent of which being graduated to the extreme curves of the road, is sufficient to counteract the shortest curves, thereby enabling the wheels to travel much shorter curves, and at the same time avoid some of the disadvantages of a cone extending over the whole tread of the wheel. This effect is materially aided by the free and unrestrained action afforded to the cone of the wheels, by the peculiar construction of the wagons adopted by the Baltimore and Ohio Railroad Company."

"These improvements cannot fail to secure a profitable return for money invested in this road, and will undoubtedly induce the company to adopt steam as a moving power upon it, instead of horses, as was at first anticipated. Steam will be found not only to produce a great saving in the cost of transportation, but with it, a much higher rate of speed may be attained for goods and produce, as well as passengers, than by animal power, it being one of the advantages of steam power on railroads, that the cost of transportation is very little, if any, increased by an augmentation of speed. You will also thereby be enabled to avoid the great perplexity and delay which would originate from two rates of speed, viz ;—the one for goods, &c., and

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the other for passengers, and the cost of constructing numerous turnout, to accommodate such arrangement, will be saved."

"Very respectfully,

ROSS WINANS."

"P. S. In my remarks upon the operations on the road to-day, I find I have omitted to make mention of an important improvement which I understand has been introduced by Mr. Elgar, in the fixing and arrangement of the switches or turnout. This improvement, I am satisfied, will greatly facilitate the passage of the cars from one track to the other, and is, as far as I have seen, entirely new."

And if yea, was the same published by you from the "Gazette," of Baltimore, as an authentic letter which had passed between the said parties, viz., Ross Winans, the Complainant, to Philip E. Thomas, President of the said Railroad Company? and will you also state all your further knowledge of said letter, and in relation to the facts and things therein referred to?

[Objected to by Defendant's Attorney.]

A. I do find the words set forth in the question. I believed it was copied at that time as an authentic letter from Ross Winans to Philip E. Thomas, President of the Baltimore and Ohio Railroad. I can't say any thing further than that I believe it was taken from the Gazette of Baltimore.

Thereupon adjourned (as tomorrow is Sunday) to Monday, the 20th day of June, 1853, at ten o'clock, A. M.

On this 20th day of June, 1853, appeared before me, the Commissioner, William W. Hubbell, Esquire, Attorney for the Defendant, Charles D. Gould, Esquire, Attorney for the Plaintiff, and the witness, Thomas Murphy; and thereupon I further proceed with the deposition of the said Thomas Murphy, as follows, to wit:

X Q. No. 6. Will you now turn to No. 9,748 of said paper, published July 26th, 1830, and state whether you do or not find on the second page of said paper, an article copied "From the Western Statesman, published at Laurenceburgh, Indiana,"? and if yea, is not a part of it a letter from Casper W. Weaver, superintendent of the graduation and masonry on the said Baltimore and Ohio Railroad, at the time said letter is dated, and do you not find the following words and dates therein, viz.?

"BALTIMORE, June 17th, 1830.

"Sir: your letter of the 12th of this instant, making sundry inquiries respecting the Baltimore and Ohio Railroad, has been duly received, and I will with pleasure endeavor to give you the information you ask.

"At this time thirteen miles of the road are under travel, and have been since the 24th of last month. During this summer twelve miles more will be completed. It is confidently believed that this distance (thirteen miles) has cost more than double as much as any portion of equal length in a continuous line will cost. Yet notwithstanding the very heavy expenditure upon it, occasioned by the peculiar formation of the ground over which it passes, and the difficulty experienced in getting stone for the masonry; and notwithstanding the fact that not more than half cars enough to accommodate the travel had been prepared, the receipts on this portion have been, as I am informed, equal to ten per centum per annum on the great capital expended in its construction. The charge allowed by law for passengers is only three cents a mile; and you are aware that no cars of bur-

then have yet been put upon the road, and consequently this per centum is derived from passengers alone.

"One horse will draw, during the day, ten tons, or about one hundred barrels of flour, at a rate of two miles an hour, and from forty to sixty persons, at the ordinary travelling rate of six to eight miles an hour, with great ease. At a rate of ten miles an hour one horse now takes thirty persons. When the road is finished to the Ohio river, passengers may be conveyed there by horse power in thirty-six hours, and by steam power in twenty-four hours, or less, without the slightest risk of fatigue, but on the contrary experience great pleasure from the ride. Of this you can judge as well as any other person, as you subjected yourself to delay and inconvenience in order to examine the work and test its power and capacity to afford that improved communication which the vast trade of the West so imperatively demands. Since this work has been commenced it seems as though the inventive genius of both Europe and the United States has been directed to the improvement of the system. Excellent results have already been produced. A great improvement has been effected in the locomotive engine in England, and the application of friction-saving wheels, by Mr. Winans, and the conical wheels by Mr. Jonathan Knight, a chief engineer of our own country, have contributed to render the railroad system at least fifty per cent. better than it was when this work was first projected. The conical wheel, by Mr. Knight, is of great value, as it enables the car to turn a curve of short radius, without difficulty, and removes, in a great degree, the objection which heretofore existed to curved roads. And, however the friends of the system might then have esteemed it as superior to the canal system, not a shadow of doubt can now remain of its superiority, on the mind of any one who will investigate the principles of both."

And is not the said letter addressed to "Hon. John Test, Lawrenceburgh, Indiana," and signed, "I am yours, very respectfully, Casper W. Weaver."

[Objected to by Defendant's Attorney.]

A. I do find said words and dates in said paper, copied from the Western Statesman, published at Lawrenceburgh, Indiana. It is addressed as stated, and signed, "I am yours, very respectfully, Casper W. Weaver."

Thereupon adjourned until to-morrow morning, the 21st June, 1853, at 10 o'clock, A.M.

On this 21st June, 1853, appeared before the Commissioner, W. W. Hubbell, Esquire, Attorney for the Defendant, Charles D. Gould, Esquire, Attorney for the Plaintiff, and the witness, Thomas Murphy, and thereupon I further proceed with the deposition of the said Thomas Murphy, as follows, to wit:

X Q. No. 7. Will you now turn to No. 9,887 of said paper, being part of the file for the year 1831, published in the year 1831, being included in a different volume from that produced at the request of the Attorney for the Defendant, and state whether you do or not find in the said number, published on the 7th of January, 1831, under the editorial head, the following notice, viz.?

"We have great satisfaction in laying before our readers the annexed advertisement from the Baltimore and Ohio Railroad Company. The measure which the enlightened directors of the company have adopted, is, of all others, best calculated to bring into play the inventive genius and mechanical skill of our country, and will, no doubt, be attended with the most gratifying results. The premiums which the com-



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pany have offered, will ensure to the successful competitors an ample remuneration, whilst the fame and future emolument which they will derive from their inventions, will be of a value which is only to be measured by the extension and increase of the mode of transportation which they are intended to perfect.—*Gazette.*"

" OFFICE OF THE BALTIMORE AND OHIO RAILROAD COMPANY, }  
4th January, 1831. }

" The Baltimore and Ohio Railroad Company, being desirous of obtaining a supply of LOCOMOTIVE STEAM ENGINES, of *American manufacture*, adapted to their road, the President and Directors HEREBY GIVE PUBLIC NOTICE that they will pay the sum of FOUR THOUSAND DOLLARS for the most approved ENGINE, which shall be delivered for trial upon the road, on or before the 1st of June, 1831; and that they will also pay THREE THOUSAND FIVE HUNDRED DOLLARS for the engine which shall be adjudged the next best, and be delivered as aforesaid, subject to the following conditions, to wit:

" 1st. The engine must burn coke or coal, and must consume its own smoke.

" 2nd. The engine, when in operation, must not exceed three and a half tons weight, and must, on a level road, be capable of drawing, day by day, fifteen tons, inclusive of the weight of the wagons, fifteen miles per hour. The company to furnish wagons of Winans's construction, the friction of which will not exceed five pounds to the ton.

" 3rd. In deciding on the relative advantages of the several engines, the company will take into consideration their respective weights, power, and durability, and all other things being equal, will adjudge a preference to the engine weighing the least.

" 4th. The flanges are to run on the inside of the rail. The form of the cone and flanges, and the tread of the wheels must be such as are now in use on the road. If the working parts are so connected as to work with the adhesion of all the four wheels, then all the wheels shall be of equal diameter, not to exceed three feet, but if the connection be such as to work with the adhesion of two wheels only, then those two wheels may have a diameter not exceeding four feet, and the other two wheels shall be two and a half feet in diameter, and shall work with Winans's friction wheels, which last will be furnished upon application to the company. The flanges to be four feet seven and a half inches apart, from outside to outside. The wheels to be coupled four feet from centre to centre, in order to suit curves of short radius.

" 5th. The pressure of the steam not to exceed one hundred pounds to the square inch, and, as a less pressure will be preferred, the company, in deciding on the advantages of the several engines, will take into consideration their relative degrees of pressure. The company will be at liberty to put the boiler, fire tube, cylinder, &c., to the test of a pressure of water, not exceeding three times the pressure of the steam intended to be worked, without being answerable for any damage the machine may receive in consequence of such test.

" 6th. There must be two safety valves, one of which must be completely out of the reach or controul of the engine-man, and neither of which must be fastened down while the engine is working.

" 7th. The engine and boiler must be supported on springs, and rest on four wheels, and the height from the ground to the top of the chimney must not exceed TWELVE feet.

" 8th. There must be a mechanical gauge affixed to the machine, with an index rod, showing the steam pressure above fifty pounds per square inch, and constructed to blow out at one hundred and twenty pounds.

" 9th. The engines which may appear to offer the greatest advantages will be subjected to the performance of thirty days regular work on the road; at the end of which time, if they shall have proved durable, and continue to be capable of per-



forming agreeably to their first exhibition, as aforesaid, they will be received and paid for as here stipulated.


P. E. THOMAS, *President.*"

"N. B. The Railroad Company will provide and will furnish a tender and supply of water and fuel for trial."

"Persons desirous of examining the road, or of obtaining more minute information, are invited to address themselves to the President of the company."

"The least radius of curvature of the road is 400 feet. Competitors who arrive with their engines before the 1st of June, will be allowed to make experiments on the road previous to that day."

"*Ja. 7.*"

" The Editors of the National Gazette, Philadelphia; Commercial Advertiser, New York; and Pittsburgh Statesman, will copy the above once a week, for four weeks, and forward their bills to the B. & O. R. R. Co."

And, if yea, did you not publish the same as an advertisement during the time therein specified, and did or not the said Baltimore and Ohio Railroad Company pay you for the same?

And will you also turn to No. 1,034 of the same file of the said paper, contained in the same volume last referred to, published June 28, 1831, and state whether you do or not find on the second page of said paper the following, as an editorial, viz.?

"The public exhibition of the locomotive engines on the Baltimore and Ohio Railroad, which was to have commenced yesterday, is necessarily deferred for a few days. The 27th of the present month, it was supposed, would have afforded the makers of the different engines sufficient time to have finished them, and also to have adjusted their working parts by private experiments; but, inasmuch as this supposition has proved erroneous, a further postponement of some days is requisite. The engine of Mr. Davis, of York, Penn., has been materially altered since its trials of last winter, and, from the success which has attended the private experiments which have been made with it in the last few days, it promises to perform well. The rotary engine of Mr. Childs, of Philadelphia, is also on the ground. An engine from New York was landed yesterday, and a fourth from the interior of Pennsylvania is hourly expected. The engines will all be placed on the road as early as possible, where they will be tried by the inventors, and such alterations and adjustments made as may be required. As soon thereafter as the Board of Directors receive notice of their being in readiness for the public trial, the Board will cause it to be announced, in order that all who desire to witness the interesting spectacle may be present."

And, if yea, was it published in the said paper under the date it purports to have been, and are the facts and occurrences therein stated true as therein stated?

[Objected to by Defendant's Attorney.]

A. The said notice is so marked as an advertisement to be published, and I believe it was published as marked, that is, once a week for four weeks.

I know that the editorial of the 28th June, 1831, extracted above, was published on that day, and I believe the facts therein stated are true.

The notice of the Baltimore and Ohio Railroad Company, extracted in the first part of the interrogatory, is placed in the editorial column, but it was published as an advertisement, and was placed there simply for the purpose of giving it prominence on its first insertion.

THOMAS MURPHY.

Sworn to and subscribed before

LEVIN GALE, *Com.*

The Attorney for the Plaintiff now files with the Commissioner the following notice :

The Attorney for the Complainant having obtained permission of the Treasurer of the Baltimore and Ohio Railroad Company to exhibit to the Attorney for the Defendant, the papers loaned by the said company to the Complainant, with further permission to have copies made of them, herewith tenders free and full access to them by the Defendant's Attorney, at some place mutually convenient, for the purpose of examination, or of copying them.

June 18th, 1853.

CHARLES D. GOULD, for Complainant.

W. W. HUBBELL, Esq., Defendant's Attorney.

The Defendant's Attorney says in reply that he too was necessitated to call upon the Treasurer of the Baltimore and Ohio Railroad Company, after having twice requested the Plaintiff's Attorney to produce those papers for the inspection of the Defendant's Attorney, and while his witnesses were under examination, and no such papers except what the Plaintiff himself [?] to use in cross-examination were produced. In calling upon the Treasurer, he seemed surprised that Defendant's Attorney had not had access to the papers, and said he would send to Mr. Winans upon the subject. Several of the papers were enumerated yesterday to the Plaintiff's Attorney by the Defendant's Attorney, and the Plaintiff's Attorney promised to bring them this morning, but failed to do so; alleging that Mr. Winans refused to permit them to be brought here to be mixed up with other papers, though it appears he did not fear that those which he desired to use and produce would be mixed up with other papers. The papers which Defendant's Attorney requested and expected to have this morning, for his inspection, under the promise of yesterday, were the pay-rolls of Conduce Gatch and the men under his control, for the year 1830, from the month of July, for the whole of the year 1831, and for part of the year 1832.

The Complainant's Attorney remarks in reply, that the Commissioner peremptorily declined to allow his office to be used for the inspection of the papers referred to; and that the Complainant's Attorney, since permission was obtained from the Treasurer of said company, has *on various occasions and at all times* offered free access to the said papers at some place mutually convenient; which place he has asked the Defendant's Attorney to designate; and that the said papers *are still subject to his examination or use*, to obtain copies of them; but that being quite numerous, amounting to over two hundred, and many of them being on scraps of paper and others original vouchers for large sums of money, he has been instructed to be very careful with them; and as Mr. Hubbell would designate no place, the Complainant's Attorney offered to exhibit them at the only private place under his control or to which he had access, viz., in a private room on Mr. Winans's premises, adjoining his counting room.

The Defendant's Attorney says in reply that he offered to go where the papers were said to be at the time, to wit, at Ross Winans's dwelling house, to see them, and that the Plaintiff's Attorney remarked that that was not convenient, and subsequently promised to bring those before this morning, as before stated. The Defendant's Attorney has never seen the papers, and there has been, therefore, he says, no actual tender of them.

The Attorney for the Plaintiff now, as on various previous occasions, asks for the production of Conduce Gatch for cross-examination upon the statements made on his re-examination in chief.

The Defendant's Attorney replies that Conduce Gatch has been examined and cross-examined and dismissed, and he has no control over him. That he handed him over to the Plaintiff's Attorney for re-cross-examination, and the Plaintiff's Attorney chose to absent himself, although Conduce Gatch and the Defendant's Attorney were here several times for the purpose of such further examination on the part of the Plaintiff's Attorney. And as the time allowed in the case for taking depositions is very short, and as will appear from these depositions a great portion of it has been unnecessarily wasted by the Plaintiff's Attorney, the Defendant's Attorney was compelled to proceed with his witnesses, and now closes the taking of depositions under this notice.

The Attorney for the Complainant protests against closing of the deposition of Conduce Gatch, a witness produced by the Defendant, before the said witness has been cross-examined, relative to the statements made on his re-examination in chief, because of the introduction of original leading matter into such re-examination in chief; and here offers the Attorney for the Defendant to pay the said witness, Conduce Gatch, such amount of money, in addition to his per diem, as he, the said Gatch, will deem liberal and ample compensation for the loss of time and injury to his business, that the facts and things done by said Gatch, which are material to the issues herein, may be more fully known, and that equal justice be done between the parties hereto.

The Plaintiff's Attorney here handed to the Commissioner a copy of each of the pay-rolls referred to by Defendant's Attorney, and in the deposition of Conduce Gatch, which copies of the pay-rolls the Commissioner compared with originals, and ascertained them to be correct copies, and returns the said copies herewith.

The Defendant's Attorney objects to said copies being filed with the depositions.

And I, Levin Gale, a Commissioner as aforesaid, do also certify, that the reason for taking the foregoing depositions of Jacob Rupp, Conduce Gatch, Thomas Murphy, Isaac Monroe, John S. Sumner, Leonard Forrest, and John M. Eichelberger, is, and the fact is, that the said witnesses, and each of them, reside within the State of Maryland, and more than one hundred miles from the place of trial of said cause. And I do also certify that the annexed notice was served on Ross Winans, the Plaintiff, on the 15th day of April, 1853, and that the taking of the depositions of Jacob Rupp, Leonard Forrest, and John M. Eichelberger was attended by Charles D. Gould, Esq., Attorney for the Plaintiff, and that he was allowed to put such interrogatories on behalf of the Plaintiff as he thought fit; that he was present during all that part of the deposition of Thomas Murphy as took place or was given after he was recalled; and that he was present during the taking of the deposition of Conduce Gatch, except on the days hereinbefore stated, in which he is stated to have been absent.

And I do also certify that the said Jacob Rupp, Conduce Gatch, Thomas Murphy, Isaac Monroe, John S. Sumner, Leonard Forrest and John M. Eichelberger, were by me severally first carefully examined

# 622 DEPOSITION OF THOMAS MURPHY, FOR RESPONDENTS.

and cautioned, and duly sworn, according to law, to testify the whole truth, and that the foregoing depositions were then reduced to writing by me, and thereafter subscribed by the said deponent [?] in my presence. And I do further certify, that I am not of counsel or attorney for either of the parties to the said cause, and that I am not interested in the event of the said cause; and I have retained the said depositions in my possession, and shall, together with my certificate of the reasons as aforesaid of their being taken, seal up the same, and direct them to the Court for which they are taken.

Given under my hand and seal, at the city of Baltimore, within the District of Maryland, this twenty-first day of June, in the year of our Lord one thousand eight hundred and fifty-three.

LEVIN GALE. [Seal.]

## DEFENDANT'S EXHIBIT H,

Referred to in the Deposition of Conduce Gatch, taken before Levin Gale, Commissioner.

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

Washington Frost,	-	-	April 3d, 1830.
C. Gatch,	-	-	do.
F. A. Gatch,	-	-	do.
Michael Glenn,	-	-	17, do.
6 or 7 laborers.			
John Eichelberger,	-	-	June 11th, 1830.
Plumer Sank,	-	-	April 3d, 1830.
Isaiah Terry,	-	-	3d, do.
J. Rupp,	-	-	16, do.
O. Cromwell,	-	-	May 31, 1830.
C. Baker,	-	-	June 11th, 1830.
Reuben Aler,	-	-	June 25, 1830.
E. Eichelberger,	-	-	August 17, 1831.
John Rupp,	-	-	April 25, 1831.
Henry Reynolds.			
436 ft. white pine, a 2½.			
232 ft. wide poplar, a 3½			

Defendant's Exhibit H.

C. GATCH.

This day the Commissioner, pursuant to the notice of Defendant's attorney, asked the Plaintiff's Attorney if he intended to pay for his cross-examination of witnesses, after the notice given by Defendant's Attorney; and the Plaintiff's Attorney refusing to pay for the same, the Commissioner informed the Defendant's Attorney he should retain the whole of the depositions until all of his fees were paid; whereupon he paid by check the Commissioner's fees, including therein \$78 which he alleges were properly chargeable to Plaintiff.

June 21, 1853.

LEVIN GALE, Comm'r.

*The United States of America, District of Maryland, to wit :*

I, Thomas Spicer, Clerk of the Circuit Court of the United States for the Fourth Circuit in and for the Maryland District, do hereby certify,



that Levin Gale, Esquire, before whom the foregoing depositions were taken, was at the time of taking the same, and now is a Commissioner duly appointed by the Circuit Court of the United States for the Fourth Circuit in and for the Maryland District, pursuant to the Act of Congress, entitled "An Act for the more convenient taking of affidavits and bail in civil causes depending in the Courts of the United States," and to all his acts as such, full faith and credit is and ought to be given, as well in courts of justice as thereout.

In testimony whereof, I hereunto subscribe my name, and affix the seal of the said Circuit Court, this twenty-first day of June, in the year of our Lord one thousand eight hundred and fifty-three.

Cost 50 cents.

THO. SPICER, *Clerk Cir. Ct.*

IN THE CIRCUIT COURT OF THE UNITED STATES

FOR THE DISTRICT OF MASSACHUSETTS.

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

To ROSS WINANS.

You are hereby notified that the undersigned, a Commissioner appointed by the Circuit Court of the United States for the Fourth Circuit in and for the District of Maryland, pursuant to the Act of Congress, entitled "An act for the more convenient taking of affidavits and bail in civil causes depending in the courts of the United States," will proceed, at his office, No. 5, Court House Lane, in the City of Baltimore, within the District of Maryland, on the eighteenth day of April, in the year eighteen hundred and fifty-three, at four o'clock, P. M., and from day to day thereafter until completed, to take the depositions of such witnesses as may be produced before him, on behalf of the Defendant in the above entitled cause, which witnesses are to be examined before the undersigned Commissioner, because they reside within the District of Maryland, and more than one hundred miles from the place of trial of the above entitled cause, and you are hereby notified to attend at the taking of the same to put interrogatories to the witnesses examined, if you shall think fit.

Given under my hand, this fifteenth day of April, in the year eighteen hundred and fifty-three.

LEVIN GALE, *Com.*

Service of copy of the above notice, admitted this 15th day of April, 1853.

ROSS WINANS.

## UNITED STATES OF AMERICA.

THE CIRCUIT COURT OF THE UNITED STATES, WITHIN AND FOR THE MASSACHUSETTS DISTRICT.

MASSACHUSETTS DISTRICT, ss.

To Charles F. Hazlitt, and Robert P. Kane, of Philadelphia, in the District of Pennsylvania, Esquires.

Know ye, that reposing confidence in your wisdom, prudence, and fidelity, we have appointed, and by these presents do authorize and empower you to take the answers to the interrogatories hereunto annexed, of Oliver Byrne, Wm. B. Aitlsen, Stephen Ustick, Jacob C. Carn-cross, John Rupp, Edward May, John A. McClain, John Murphy, Wm. E. Rutter, Isaac Dripps, Edward Gillingham, Henry Schultz, David Mathers, Asa Whitney, Curry, Harman Yeckes, Laban B. Procter, Joseph L. Kite, Geo. W. Smith, John Edgar Thompson, Wm. Pettit, Septimus Norris, S. M. Felton, Edward Martin, John C. A. Smith, Richard French, Jacob Schryack, witnesses to be examined on behalf of the Defendants, and to be used in a certain cause now pending in said Court, wherein Ross Winans is Plaintiff, versus the Eastern Railroad Company, Defendant.

And to this end, at certain days to be by you appointed for that purpose, to cause said witnesses, as aforesaid, to be brought before you, and each witness, while present before you, to examine carefully on oath, touching the premises. And when you shall have taken the examination as aforesaid, to reduce, or cause the same to be reduced, to writing, and to be subscribed by each of said witnesses in your presence. And the same so taken and subscribed, to return, together with this Commission, and your doings herein enclosed, sealed and directed to the Circuit Court aforesaid, as soon as the same shall have been executed.

In testimony whereof, we have caused the seal of the said Circuit Court to be hereunto affixed.

Witness, the Honorable Roger B. Taney, at Boston, this eighth day of October, in the year of our Lord one thousand eight hundred and fifty-three.

H. W. FULLER, *Clerk*.

N.B.—You shall not, except by consent of the parties in writing, permit either party to attend at the taking of the deposition, either himself, or by any attorney or agent, nor to communicate by interrogatories or suggestions with the deponents, whilst giving their depositions in answer to the interrogatories annexed to this commission. And you shall take such depositions in a place separate and apart from all other persons, and permit no person to be present during such examination, except the deponents and yourself, and such disinterested person (if any) as you may think fit to appoint as a clerk, to assist you in reducing the depositions to writing. And you shall put the several interrogatories and cross-interrogatories to the deponents in their order, and take the answer of the deponents to each fully and clearly.

To the Honorable the Judges of the Circuit Court of the United States  
for the Massachusetts District.

The execution of the within Commission appears in certain schedules hereto annexed.

So answers,

CHAS. HEAZLITT,  
ROBERT P. KANE,  
*Commissioners.*

## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

WINANS vs. EASTERN RAILROAD COMPANY.

*Interrogatories to be proposed on behalf of the Respondent, to John Rupp, of Hanover, in the State of Pennsylvania.*

1. What is your name, age, place of residence, and business?
2. When, if ever, were you in the employ of the Baltimore and Ohio Railroad Company? when did you begin? what did you work upon at first?
3. Did you at any time, and if so when, work upon any part of the car "Columbus"? If so, when did you work so, and what did you do? when did you work, and when did you leave, and what shop did you go to?
4. Whether at any time, and if so when, did you see any eight-wheel double truck wood cars? where were you when you saw them, and how many, and how often did you see them?
5. Whether or not were they constructed upon the same principle as the car "Columbus"? if not, state wherein they differed.
6. What use, if any, was made of said eight-wheel wood cars?
7. How were they constructed? and will you annex or identify a model of the same?
8. How did said cars appear when you first saw them?
9. Do you recollect doing anything to any one of these eight-wheel cars while you were at work at the St. Clare shop? if yea, what was it you did?
10. Do you know who was the inventor of the "Columbus"? if so, who was it? who claimed to be the inventor of her when she was first put in operation?
11. Whether or not did you ever see any drawing of said car "Columbus" in the possession of Oliver Cromwell?

12. Who were near you, or at work in the same shop with you, on the trucks of said car, if any persons were so at work?

13. Do you recollect hearing Ross Winans giving any one directions about building the car "Columbus," and were you or not in a position or situation to have known or heard them, if any directions had been given to those who were at work on the iron work?

14. Will you annex to your answer, or will you identify a true model of the car "Columbus," as she was actually built when first put upon the road? and will you also describe how she was built?

15. Can you state any other matter or thing that may be of benefit to the Defendant?

WILLIAM WHITING, *Defendant's Solicitor.*

### UNITED STATES CIRCUIT COURT.

#### MASSACHUSETTS DISTRICT.

ROSS WINANS, IN EQUITY, *vs.* THE EASTERN RAILROAD COMPANY.

*Cross-Interrogatories to John Rupp, on behalf of the Complainant.*

X 1. State precisely the day of the month and year when you entered the service of the Baltimore and Ohio Railroad Company. If you cannot, state as nearly as you can, and give the reasons why you so fix the date, and the cause for your remembering.

X 2. If you say that you saw eight-wheel wood cars on said road, in 1831 and 1832, please state the manner in which they were drawn; whether by the truck or by the body of the car?

X 3. Were they not composed of two ordinary four-wheel cars?

X 4. How do you know who invented the car "Columbus"? State your means of knowledge.

X 5. What were the duties of Ross Winans about the workshop of the said Baltimore and Ohio Railroad Company, while you were in the service of said Company?

X 6. Have you seen, heard, or had stated to you, the substance of any of the above interrogatories prior to your present examination?

C. P. CURTIS, Jr., *Compt's Sol'r.*



## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

*Interrogatories proposed to Edward Gillingham, of Baltimore, on behalf of the Respondent.*

1. State your name, age, residence, and business or occupation.
2. State how, or in what manner, and when you have been connected with railroads, or the manufacture of railroad machinery?
3. State the name of your father, whether he is living; if not, when did he die? and state whether he was connected with any railroad, or the manufacture of railroad machinery, when, in what capacity, with whom, and what kind of machinery.
4. State what duties you performed in connection with your father's business, where his shops were, and what opportunities you had for seeing the progress of the railroad and railroad cars.
5. State what cars you saw on the Baltimore and Ohio Railroad, with more than four wheels; how many wheels they had when you first saw them; in what they were employed, and who superintended or got them up; and describe the said cars, and annex or identify a model of the same.
6. Was your father connected with the use of eight-wheel cars in any way? if so, in what way, and on what occasion or business?
7. Whether or not you recollect an eight-wheel car to carry passengers on said road? If so, what was her name? Did you ride on her, and when was she built?
8. Whether or not the said eight-wheel passenger car was built under the directions of any one? If so, who?
9. Will you describe the said eight-wheel car, as she was when first built, and annex or identify a model of the same?
10. Did your father make any boxes for railroad cars? If so, when, and for whom, and what kind were they? Were any such put on the car Columbus? If so, when, and if other alterations were made in her, what were they, and when and where were they made?
11. Do you know Ross Winans, the Plaintiff? How long have you known him? In what business has he been engaged, and where has he been so engaged?

12. If you know any other matter or thing of advantage to the Respondent in this case, please state the same.

WILLIAM WHITING, *Def't's Sol'r.*

The Complainant declines to put cross-interrogatories to this witness.

C. P. CURTIS, JR., *for Compl't.*

### CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

*Interrogatories proposed to Henry Shultz, of Baltimore, on behalf of Respondent.*

1. State your name, age, residence, or occupation, and how long you have been so engaged.
2. If you answer that you are a car builder, state where you first worked at cars, for whom, and at what time you commenced.
3. When and where did you first see the car Columbus? in what business was she employed?
4. Describe the car Columbus as she was constructed when you first saw her; and if you can, annex or identify a model of her.
5. Were any alterations afterwards made in the Columbus? If so, when and where were they made, and what were the alterations?
6. Were any other eight-wheel cars on the road, or about the shop, when you saw the Columbus? If so, describe their construction, state how they looked, what was done to them, what they were used for, how many you saw, when and where you saw them, and if you can, annex or identify a model of the same.
7. Who was credited with the originating or constructing of the eight-wheel cars, and who superintended their construction from time to time?
8. Who was at work at the Charles Street shop when you went there? Name such as you remember.
9. Who superintended the work there?
10. What other if any eight-wheel cars for passengers, were built at the Charles Street shop, and when were they so built, under whose directions? Describe their construction, and how they were drawn.
11. Whether or not was a contract made for the building of cars? If so, between whom was it made, and were you a party to its execu-

tion? How many cars were contracted for, what kind were they, and when was the contract made?

12. When, if ever, was the building of these cars commenced, and when was the first money drawn?

13. Whether or not had you to wait for iron work, and in what state were the cars then, and what took place as to the mode of drawing them? between whom did it take place, and at what time?

14. Whether or not were bodies finished and waiting for iron work? had they or had they not, the mode of drawing attached, and what was it?

15. Which were the first cars that drew by a coupling from the middle of the end of the body?

16. Whether or not were the Washington cars afterwards built, and how did they draw, and who made the first frames for them?

17. Whether or not were all the eight-wheel cars afterwards built to draw by a coupling, from the middle of the end of the body? And when did you finish your contract, and how many cars were built under it?

18. Describe the cars you built under the contract. And examine the drawing of the railroad freight car, hereto annexed, (see drawing A,) and whether it represents the freight cars constructed by you, or what cars it does represent, when they were constructed and first put upon the Baltimore and Ohio Railroad?

19. When did you engage a car building, with the Philadelphia, Wilmington and Baltimore Railroad Company? where, or at what place? what have been your duties, and what work have you done?

20. Describe the eight-wheel passenger cars built by you, and as in general use on Philadelphia, Wilmington and Baltimore Railroad, and state their essential construction and principles.

21. How are the said cars constructed, as to the distance between the bearing points of the wheels on the rails, and the distance of the centre of the bolsters from the end of the bottom framing? and how do the same compare with the car Columbus?

22. Have you examined, and do you understand the specification of Ross Winans's Patent, of October 1st, 1834? if not, will you examine the copy of the same annexed?

23. Have you examined the model now shown to you by the Commissioner, marked B? if not, will you now examine the same, and will you state whether it is or is not a true representation of the car de-

scribed and recommended in said specification? and if not, in what respects it differs therefrom?

24. Whether or not will a car constructed according to Ross Winans's specification, be practically useful, how will it act, and what is the effect of such a car on a railroad?

25. What are the essential points of construction of the eight wheel cars, as built by you, and in general use; and whether or not such points of construction and action are vital to their safety and good operation?

WILLIAM WHITING, *Solicitor of Respondent.*

*Cross Interrogatories to Henry Schultz.*

X 1. If you have sworn that the model B is an exact representation of Ross Winans's eight wheel car, please to show where, in said model, the point of draft is indicated.

X 2. Please examine the drawing attached to Winans's patent, and state how much bearing surface there is there shown, between the upper and lower bolster, or between the car body and the truck. How much such bearing surface is shown in model B?

X 3. Had the copy of Winans's patent, examined by you in pursuance of the 22d interrogatory in chief, any drawing annexed?

X 4. If you shall say, in answer to the 24th interrogatory, that such a car as is therein mentioned, will not be useful, state the reasons why, and state particularly, in detail, the deficiencies of the same, and give your reasons therefor, and whether they are the result of experiment or hypothesis?

X 5. In the cars now built by you, have you two independent swivel trucks under the extremities of a long car body? Have the cars the point of draft by the end of the body? What is the length of the body of said cars, and what are the dimensions of the truck frames? What is the size of the wheels, and the distance apart of the axles of the trucks?

X 6. Have you any license or authority, either written or verbal, from any one, to manufacture said cars? if yea, annex a copy, if in writing.

X 7. Have you seen, heard, or had stated to you, the substance of any of the foregoing interrogatories, prior to your present examination?

C. P. CURTIS, Jr. *Complainant's Solicitor.*



## CIRCUIT COURT OF THE UNITED STATES

FOR THE DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

*Interrogatories to Edward May, of Baltimore, on the part of the Respondents.*

1. What is your name, age, place of residence, and business, formerly and now ?

2. Whether or not, in the fall of 1831, did you work for any Company ? if so, what Company was it, what did you do, where did you do it, and when did you get it done ?

3. Whether or not was any track laid from Charles street shop ? and if yea, when was it laid, and where did it lead to ?

4. Whether or not, immediately after said track was laid, did you see any railroad cars upon the same ? Will you state when you saw them, how you came to see them, what, if anything, was to be done to them, and what was the appearance of said cars ? and will you describe the standards, if there were any ? Who was the inventor of said eight-wheel cars ? and describe said cars, and annex or identify a model of the same.

5. Will you state how many of said eight-wheel cars, if any, were running upon said road in the spring of 1832, or how many you saw, and whether or not they were then in common use on said road ? and how long had they been in use before you saw them on said branch, if you have any means of knowing ?

6. Whether or not, have you ever heard, at any time, that Ross Winans claimed to be the inventor of the eight-wheel double truck railroad car, prior to the fall of the year 1851 ?

7. Whether or not were there any eight-wheel passenger cars upon the said road, in the spring of 1832 and 1833 ? and if so, were they or were they not the same in principle of construction and operation as the wood and freight cars first described by you, as seen on said road ?

[Objected to, the witness not being shown to be an expert.]

8. Do you know at what shop any of these eight-wheel passenger cars were built ? if so, what shop, and when ?

9. Whether or not did you build any eight-wheel burthen cars ? if so, when, on what principle of construction, how did they operate, and what use was made of them ?

10. Do you know anything of any timber cars being in use at that time ? if so, when did you see them, how were they constructed ?

11. Did you see the Columbus, Dromedary, Winchester, and Comet, and other eight-wheel cars, afterwards put upon the Baltimore and Ohio Railroad, and the cars now in general use upon railroads? and will you state whether or not there is any substantial difference in the construction and operation of said cars, from the construction and operation of the said wood and freight cars, so far as relates to the running parts, and the connection of the running part with the body or platform?

12. Do you know Conduce Gatch? how long have you been acquainted with him? will you state what you know as to his capacity for invention?

13. Do you know any other matter or thing of interest or advantage to the Respondent, in this suit? if so, please state the same.

WILLIAM WHITING, *Respondent's Solicitor.*

*Cross Interrogatories by Complainant.*

X 1. Please to state what you consider to be the principle of the eight-wheel car in common use?

X 2. Have you studied engineering? scientific mechanics? and if so, to what extent, and how long?

C. P. CURTIS, Jr., *for Complainant.*

CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

WINANS vs. EASTERN RAILROAD CO.

*Interrogatories proposed on the part of Defendants to William E. Rutter.*

1. What is your name, age, place of business and residence?

2. Where did you learn your trade? and with whom and when?

3. Whether or not were you present at the commencement of the Baltimore and Ohio Railroad, what position you held on that occasion, who else was present, and when was it?

4. Do you know anything about any eight-wheel railroad cars used on said road; if so, when did you first see them in use, and what were they used for?

5. Did you ever see the car "Columbus," and do you know when

she was commenced, and whether or not were said eight-wheel cars in operation before the "Columbus" was commenced?

6. Whether or not were any alterations made in the car "Columbus," after she was first built and put in operation; if yea, what alterations do you now recollect?

7. Whether or not were you acquainted with Oliver Cromwell, Leonard Forrest, Jacob Rupp, Francis Gatch, George Miller, and Conduce Gatch, John Rupp, Michael Glenn and Washington O. Frost, and do you know who had charge of the Mt. Clare shop?

8. How many, if any, of said eight-wheel cars were in operation, before the said "Columbus" was commenced?

9. Will you describe how these eight-wheel cars were built; and how they operated on the road, and annex or identify a model of the same?

10. Who invented the said eight-wheel cars that you may have described in your preceding answers?

11. Who invented the said car "Columbus"?

12. When, if ever, did you leave your employers, where did you go, and into whose employ; and when, if ever, did you return?

13. Will you annex to your answer, or identify before the Commissioner, a true model of the car "Columbus"?

14. What do you know about any other eight-wheel cars being made or built after your return? if anything, please state what you know.

15. Do you know any other matter or thing that may be of benefit to the Respondent; if so, please say it?

WILLIAM WHITING, *Solicitor of Defendant.*

## UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS, IN EQUITY, *vs.* THE EASTERN RAILROAD COMPANY.

*Cross-Interrogatories to William E. Rutter, on behalf of the Complainant.*

X 1. How do you know who invented the car "Columbus," and the eight-wheel wood cars, referred to in your answer to the fourth interrogatory? State particularly as to each.

X 2. Upon what do you depend to enable you to state that the said

wood cars were in use on said road before the car "Columbus" was used on the Baltimore and Ohio Railroad?

X 3. Did you have anything to do with the construction of the "Columbus," or of the wood cars spoken of by you? If so, what? Give the dimensions accurately of the "Columbus," her length, breadth, size of wheels, distance apart, and say where the point of draft was.

X 4. Were not the said wood cars composed of two four-wheel cars, such as were in ordinary use? and was not the point of draft by the frame of one of the said four-wheel cars?

X 5. Are you now constructing eight-wheel cars, similar to those in common use, and are you licensed or authorized to do so, and by whom?

X 6. Have you seen, heard, or had stated to you the substance of any of the foregoing interrogatories, prior to your present examination? If so, by whom?

C. P. CURTIS, JR., *Compt'l's Solicitor*.

## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

WINANS vs. EASTERN RAIL ROAD COMPANY.

*Interrogatories on the part of the Respondent to David Mathews.*

1. What is your name, age, place of residence and business, or profession?
2. What railroads have you been connected with, and in what capacity?
3. When, where and by whom was the first locomotive built, having a four wheel truck under the front end? when was she used? How many similar locomotives were built? and when and where were they also used?
4. Who was the inventor of said first mentioned locomotive? who made the original plan or drawings thereof? Will you annex the originals or true copies thereof, if they are in your possession? Will you state all the facts known to you, in relation to the invention of John B. Jervis, relating to these locomotives?
5. Whether or not did the construction and application of the truck, in its position, relatively to the end of the body of the engine, and in its action upon the road and on the body of the engine, develop the same physical principles as the present mode of applying the four wheel truck under or near the end of a body of a railroad car; and whether or not a duplication of the said trucks, upon the other end of the body or engine, would require invention?



6. What part, if any, of the principles of the eight wheel double truck railroad car, were embodied in said locomotive?

WILLIAM WHITING, *Respondent's Solicitor.*

*Cross Interrogatories.*

X 1. Please state fully what you mean by, or understand to be, the "principles of the eight-wheel double truck railroad car," as referred to in the 6th direct interrogatory?

X 2. Have you seen, heard, or had stated to you, the substance of any of the foregoing interrogatories, prior to your present examination?

C. P. CURTIS, JR., *Complainant's Solicitor.*

CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAIL ROAD COMPANY.

*Interrogatories proposed to John Murphy, of Philadelphia, on behalf of the Respondents.*

1. State your name, age, residence and occupation, or business; and how long a time you have been engaged in such business.

2. State whether or not you have built both four-wheel and eight-wheel passenger and freight cars, and whether or not you are acquainted with the principles of construction and operation of the eight-wheel cars in general use on railroads.

3. Whether or not you are well acquainted with Ross Winans, and have been doing business with him, and for how long? whether or not he has often been at your shop, while eight-wheel cars were being built, and knew of your building such cars, and whether or not he at any time intimated or stated that he had a patent for an eight-wheel car, or made any claim on you for constructing eight-wheel cars?

4. When and in what way did you first learn that he claimed to have a patent for an eight-wheel car?

5. Where and when did you first see an eight-wheel car, what was her name, where and how long a time was she used, and did she answer the purpose for which she was designed fully?

6. State her size, as near as you can, and describe her construction and principle of operation?

7. Who designed or invented and built her, and where and when was she built?

8. Was she used in trains; when are where and by what power was she drawn? and state whether or not other similar cars were constructed and used, and when, and where, and to what extent.

9. Have you seen and examined the Repertory of Arts, Manufactures and Agriculture, Vol. 24, Second Series, published in London, A. D. 1814, more particularly that part of said volume which includes the specifications and drawings of the patent of William and E. W. Chapman, or a true copy thereof?

10. Have you examined the model marked K? and if so, will you state whether said model truly and correctly represents any railroad car or carriage described and shown in said book and drawings?

11. Whether or not would a car builder, of ordinary skill and knowledge of his profession, be able, by aid of said specification and drawings, and without the necessity of exercising his own invention, to construct eight-wheel railroad cars substantially the same as those now used by the Eastern Railroad and other railroads generally, so far as respects the manner of arranging and connecting the eight-wheels, and the connection of the trucks with the body of the cars?

12. Whether or not has said Chapman's car, as shown in said book and drawings, side bearings, and centre pivot, and rigid rectangular wheel frame?

13. Whether or not is the distance between the bearing points of the wheels about equal to the width of the track? Will you measure the same?

14. Whether or not may this model K, now before you, be made to represent both the six and the eight-wheel carriage?

15. Have you examined a work, called "A Practical Treatise on Railroads and Carriages," by Thomas Tredgold, published in London, England, in 1825, and the drawings therein referred to, or a true copy thereof? And if so, will you state whether or not you have there found any drawings and description of any double truck eight-wheel railroad car?

16. If you answer the last interrogatory in the affirmative, will you describe said eight-wheel car, its component parts, the manner in which they are arranged and put together, and the mode in which said car is calculated to operate?

17. Have you examined the model marked A, and whether or not is said model a correct representation of said eight-wheel car of said Tredgold? If not, in what respects does it differ therefrom? Have you examined model marked C, and is it a correct representation of said eight-wheel car of said Tredgold, or of any car described by him? If not, why not?

18. Will you compare the eight-wheel car of said Tredgold with the

eight-wheel cars used by the Eastern Railroad, and in general use in this country, so far as regards the running gear; and will you state, whether or not, in their mechanical principles and mode of operation, they are or are not, substantially identical?

19. If, in answer to any preceding interrogatory, you have said that the said Tredgold car is calculated to conform to all the irregularities of railroads, will you explain whether or not it is calculated to answer the purposes and objects set forth in said Winans's specification, as designed to be accomplished by him?

20. Have you seen the Letters Patent of the United States granted to Jonas P. Fairlamb, dated January 19th, 1833, and the drawings and specifications thereof, or a true copy thereof? If yea, will you state what part, if any, of the invention described or claimed in said Winans's said patent, is described or shown in said Fairlamb's patent or drawing?

21. Whether or not would a mechanic of ordinary skill in car building, having knowledge of said Fairlamb's patent and drawings, be enabled without exercising invention, to construct eight-wheel double truck cars, substantially like those used by said Eastern Railroad, or like those now in common use on the roads of the United States? And if so constructed, whether or not would they, in your opinion, or would they not, embody the essential principles of the eight-wheel railroad car in common use, and would they or not attain the beneficial results pretended to be obtained by said Winans in his said patent?

22. Will you examine the model of the Allen Steam Carriage, marked "Horatio Allen," now shown to you by the Commissioner, and the drawings of said steam carriage, marked G and H, (see drawings G and H,) also now shown to you; and will you state what are the mechanical principles of the construction and arrangement of the running part, and whether or not it is calculated to attain the practical benefits of the eight-wheel railroad cars now in general use; and as to the construction and arrangement of the running gear, is it or is it not substantially the same as these? Whether or not does it contain the construction and organization necessary to produce the beneficial results stated and claimed to be accomplished in the said Winans's specifications, dated October 1, 1834; and what part, if any, of the invention described of said Winans, in said specification, is embodied therein?

23. Will you examine the model of the eight-wheel double truck railroad car, now before you, marked "G. Bryant," (see drawing G. Bryant,) and explain its construction and mode of operation?

Whether or not is it adapted to pass all the inequalities and curves, as well as the straight tract of the roads?

Whether or not is it constructed and operated upon the same mechanical principles, with the cars used by the Eastern Railroad; or with those now in general use on the railroads of the United States, or with the model of the Eastern Railroad cars now shown to you?

24. Whether or not is any, and if any what part of the invention described by said Ross Winans, in his letters patent, embodied in said Quincy car ?

25. Whether or not would a mechanic of ordinary skill and knowledge in building railroad cars, having knowledge of the aforesaid Quincy car in 1829 or 1830, have been able at that time, without the exercise of invention of his own, to construct double truck, eight-wheel railroad cars, substantially like those now in general use, so far as regards the arrangement of the wheels, and the connection of the trucks with the body of the cars ?

26. Have you seen or examined the treatise of Wood, published in 1825, the work of Tredgold and that of Strickland, published in 1826, and will you state whether or not, previously to the year 1830, was the mode of drawing railroad cars by a coupling from the middle of the ends of the bodies, well known and publicly used, and shown or described in sundry printed works ?

27. Will you examine the last mentioned printed works and state as to the distance of the bearing points of the wheels as compared with the width of the tracks, on the cars which are described or shown in said works ; and how the said distance compares with that of the wheels in the best constructed cars in the United States ?

28. Whether springs and pedestals, as now used on the eight-wheel double truck cars, were or were not applied to the four wheel cars described and shown in the American edition of Wood's treatise, in 1832, and in said Allen's model ?

29. Whether or not, before 1830, was the mode of causing the wheels of railroad cars to revolve with the axles, a well known equivalent for the mode of causing them to revolve on the axle-trees ? if yea, were these equivalents described and shown in any printed works prior to that date ? and have you or not built cars in both of these ways of having the wheels to revolve ?

30. Whether or not does it, in your opinion, involve any change in the mechanical principles or modes of operation in said Quincy car, to substitute for the axle-trees axles revolving with the wheels ?

Or larger wheels instead of those used, so as to cause the flanges of the wheels on each truck to approach very near each other ?

Or to draw the said car by the body instead of drawing it by the truck ?

Or to increase the length of the body of the platform ? Or to place a box upon the top of the said platform, so as to become a passenger car ? Or to cause it to run at a greater or less rate of speed ? And would it or not, in your opinion, require invention to make any and all of these changes ?



31. Whether or not, in the construction and operation of the double truck eight-wheel car, is or is not the distance of the flanges from each other, of *itself considered*, material? and how may that distance be varied, without in any way changing the mechanical principles or mode of operation of the car containing them?

32. Whether or not is the distance of the bearing points upon the rails, of the wheels in each truck, material and essential to the operation of the cars? if so, why?

33. Whether or not is the maintaining the axles of the wheels in each truck, at a fixed and uniform distance from each other, material and essential in the construction and operation of the eight-wheel car, and will you give your reasons for your opinion?

WILLIAM WHITING, *Sol'r of Resp't.*

## UNITED STATES CIRCUIT COURT.

### MASSACHUSETTS DISTRICT.

ROSS WINANS, IN EQUITY, *vs.* THE EASTERN RAILROAD COMPANY.

*Cross Interrogatories to John Murphy, on behalf of the Complainant.*

X 1. If you say you have built or are building eight-wheel cars, similar to those now in common use, what license or authority have you to do so? If in writing, annex a copy to your deposition.

X 2. State where the point of draft was, in the first eight-wheel car you saw, referred to in your answer to the fifth direct interrogatory?

X 3. Please to give the page and quote the language, or show the plate in Tredgold's Treatise, which shows any lateral swivel motion of the truck of the car therein described.

X 4. Is not the only motion of the truck shown in Tredgold's Treatise, a vertical one? if not, show where in said treatise any other is described or represented.

X 5. Please to state whether in your answer to the 18th and 19th direct interrogatories, you rest your opinion on the text and plate in Tredgold's Treatise, or upon Model A?

X 6. Please to state where in said Treatise of Tredgold, there is any indication that the point of draft is from the end of the body of the car?

X 7. How does the distance apart of the bearing points of the wheels of each truck, in the models and treatises referred to by you, in your answer to the 27th interrogatory, compare with the relative length of the whole car, in each case? and how in regard to the cars in common use?

X 8. Please to state accurately what, in your opinion, is the principle involved in the eight-wheel car now commonly used?

X 9. Have you seen, heard, or had stated to you, the substance of any of the foregoing interrogatories, prior to your present examination? if yea, by whom? C. P. CURTIS, JR., *Complainant's Solicitor*.

WILLIAM WHITING, *Def'ts Solicitor*.

## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

*Interrogatories proposed on the part of the Respondent, to Harman Yerkes, Jacob C. Carncross, Laban B. Proctor, Joseph L. Kite, John Murphy and William Pettit, of Philadelphia.*

1. What is your name, age, place of residence, and business?
2. Where was your place of business, and in whose, and in what employ were you, in the years 1833 and 1834? or did you visit Durkee, Sleighmalser and Tomlinson's office, and where was it?
3. What degree of publicity, and how much visited, if at all, was the office or place mentioned in your last answer, and who, if any one, was agent or book-keeper there?
4. If, at any time, you saw any drawing of the running part and body of any railroad car, of more than four wheels, will you state when you first saw it, where you saw it, and will you annex the same or a true copy thereof, if in your power; and if you cannot do this, will you describe said drawing, and state what it represented, and who made it?
5. Whether or not was said drawing, if any such existed, exposed to public view, and if so, where, when, and how long was it so exposed?
6. Whether or not, and if so when, did you see any complete model of any eight wheel railroad car? if so, when did you see it, where was it, in whose shop was it, and who was head man in said shop? and whether or not did said model correspond with the said drawing? if not, wherein did they differ? and who made said model, and when was it made?
7. Will you describe said model?
8. Whether or not was any car, and if any what car, constructed upon the plan of said model? if yea, where was she built, what was she called, when was she put on to any railroad, and when was she so put on any railroad, and when was she used?

9. Who furnished the means to build said model and said car; who built them, or gave the directions to build them, and for whom were they built?

10. Who, if any one, had charge of said car while running? and will you describe the said car?

11. What sum, if any, did said car earn the first day she ran? and how many passengers, or about how many, did she carry?

12. Where, if anywhere, was said car carried to, after she was first put to running, and what road was she put on to at the opening thereof, if any?

13. How long, if at all, did you remain on said last mentioned road, and who, if any one, became proprietors or owners of the said car? and for what sum was she bought?

14. Please state how the said car worked or answered the purpose? and what other cars, if any, were subsequently built, and where and what were they, and were they used?

15. Please state whether or not the said model and said first mentioned car were the same as or different from the eight-wheel cars now in general use; if they differed, wherein did they differ, and whether the same or similar cars are now in use, and where or on what roads?

[The Questions from No. 2 to 38, inclusive, which are filed to Oliver Byrne and others, of Philadelphia, are to be put to John Murphy, which see above, before putting the Cross Interrogatories.]

WILLIAM WHITING, *Respondent's Solicitor.*

*Cross Interrogatory by Complainant.*

Please state what you consider to be the principle of the common-eight-wheel railroad car?

C. P. CURTIS, Jr., *for Complainant.*

## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD CO.

*Interrogatories proposed to Oliver Byrne, of Philadelphia, on behalf of the Respondent.*

1. When and where did you first see an eight-wheel rail road car? describe the same, and for what purpose was it used, and what was its mode or principle of operation?

2. Will you state how the railroads in England and Ireland, prior to the year 1825, as to grades and curves, compared with the railroads subsequently built in England and Ireland, and in the United States?

3. Describe the character of the curves of a railroad, and the action of the trucks of an eight-wheel car such as is in general use.

4. Do you know of any other fact or thing that will be of benefit to the Respondent? If so, please state the same.

WILLIAM WHITING, *Solicitor of Respondent.*

## UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS, IN EQUITY, vs. EASTERN RAILROAD COMPANY.

### *Cross-Interrogatories to Oliver Byrne.*

X 1. Will you state how many railroads there were in Ireland prior to the year 1825, and between what places they each extended?

X 2. Of what country are you a native? How long have you been in the United States? and in what occupation were you engaged immediately prior to your coming to this country?

X 3. Are you acquainted with the Baltimore and Ohio Railroad? if so how long?

X 4. Please describe the passenger and burthen cars in use on that road accurately.

X 5. In what part of Ireland is the Killney Hill and Dalkey Railway situated? At what place does it commence? How long is it, and what kind of rail is it built with?

X 6. Was it not a train-way, and were not the cars drawn by horse power solely; and if not, by what other power, and how long, and when first?

X 7. Was it not built for the conveyance of stone from the quarry to the harbor of Kingstown, or other navigable waters? if not, state what the general nature of the business of the road is.

X 8. Please to describe accurately the eight-wheel car used on said road. Give the length of the body, breadth and height from the ground. How far apart were the wheels?

X 9. Was not the draft from the frame of one of the trucks?

X 10. Please state whether or not the said railroad is straight or curved; and if curved, how many curves, and of what radius. Is there an inclined plane? if yea, of what elevation and length?

X 11. Had the wheels of the eight-wheel cars on said railroad any flanches? If yea, how wide were they, and how wide was the tread of the wheels?



X 12. Please name the cities and towns on the line of the said railroad.

X 13. Was the average rate of speed on said railroad over five miles per hour; and if yea, what was it? Was it not rather less?

X 14. What was the average rate of speed on railways generally, at and about the year 1825, and prior to 1830?

X 15. If you say that said car was called the Chapman car, why was it so called? Had that name any connection with the car described in the 24th volume of Repertory, in 1814? If not, what Chapman was it?

X 16. Please to state fully and accurately what you mean by the principle of construction of the common eight-wheel car; and when you say that two cars are constructed upon the same principle as to the arrangement of their running gear, state what you mean by that, and whether you confine the principle of the car claimed by Mr. Winans to the running apparatus.

X 17. If, in answer to the third direct interrogatory, you make use of the phrase "normal to the track," please to state what you mean by it.

X 18. Have you seen, heard, or had stated to you, the substance of any of the above interrogatories? and if yea, by whom?

C. P. CURTIS, JR., *Compt's Solicitor.*

## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

*Interrogatories proposed to Asa Whitney, of Philadelphia, on behalf of the Respondent.*

1. What is your name, age, place of residence, and business or occupation?

2. Will you state when and where you were connected, if at all, with the application of the four-wheel truck to railroad engines, who invented or designed it, and where was it used? When was it designed and invented?

3. Describe the mode of construction and action of the said invention; to what extent was it used, and did it or not differ in the principles of its construction and application, from the principles of construction and application of the truck under the eight-wheel cars in general use? If so, wherein did it differ?

4. Whether or not was any modification or alteration of the steam

machinery necessary in any one of the engines? If so, who planned the changes in the machinery, and why was it necessary?

5. Whether or not the duplication of such trucks, under both ends of a car body, on the same principle, would involve any invention?

6. Whether or not the engine with said truck under the body, draw [?] by a coupling from the middle of the end of the body?

WM. WHITING, *Def'ts Solicitor*.

The Complainant puts the same cross-interrogatories to the above witness as to John B. Jervis.

C. P. CURTIS, JR., *Compl'ts Solicitor*.

### CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

*Interrogatories proposed to ——— Currie, of Philadelphia, on behalf of Respondent.*

1. State your name, age, residence, and occupation or business.
2. Are you acquainted with the modes and processes of restoring old pictures and drawings, and of making new pictures and new drawings to resemble old ones?
3. Will explain some of the common modes of making new drawings, or engravings, or pictures on paper, to have the resemblance of those which are old, or have been soiled with use?
4. Whether or not are either of these modes frequently practised; and, if so, which mode?

WM. WHITING, *Sol'r of Defendant*.

The Complainant objects to the above interrogatories as impertinent, and declines cross-examining.

C. P. CURTIS, JR., *Compl'ts Solicitor*.

### CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

*Interrogatories proposed to John A. McClain, of Philadelphia, on behalf of the Respondent.*

1. State your name, age, residence, and business or occupation.
2. State whether or not you are conversant with the principles of

construction and operation of the eight-wheeled railroad cars in general use, in the United States, and state your opportunities for becoming acquainted with the same.

3. State where you were born, and how long you lived in the place of your birth, when you left there, where you went, and how long you remained.

4. Where were the first eight-wheel railroad cars that you ever saw, in what were they employed at the time you saw them, and at what time was it?

5. Is the recollection of these cars that you may have mentioned, distinct in your mind?

6. Will you describe these first eight-wheel cars that you saw, and annex or identify a model of the same, and state whether or not they were the same in principle as the eight-wheel cars now in general use?

7. Did you see any other eight-wheel car on the same road on which you first saw eight-wheel cars? if so, what kind of a car was it, and for what was she used?

8. Is there any doubt on your mind as to your first seeing eight-wheel cars used, as you have stated?

9. Describe the eight-wheel cars in use on the road on which you are now employed; and state whether or not any of the eight-wheel cars in use on the same road, have long springs extending from one axle to the other, and the ends thereof bolted to the tops of the boxes, and a bolster bolted across to the middles of the two springs, with another bolster swivelling on it, like a common road wagon?

10. If you know of any other matter or thing of advantage to the Respondent in this suit, please state the same.

WILLIAM WHITING, *Defendant's Solicitor*.

## UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS, IN EQUITY, vs. THE EASTERN RAILROAD CO.

*Cross-Interrogatories to John A. McClain, on behalf of the Complainant.*

X 1. Was not the point of draft of the eight-wheel platform cars mentioned by you, by the middle of the forward truck?

X 2. What was your occupation between the years 1832 and 1840, and where were you?

X. 3. Have you received a scientific education in mechanics and other science; and if so, where and how long did you study them?

4. What do you consider to be the principle of the eight-wheel car now in common use, the invention of which is claimed by the Plaintiff?

C. P. CURTIS, JR., *Complainant's Solicitor.*

## IN THE CIRCUIT COURT OF THE UNITED STATES

FOR THE DISTRICT OF MASSACHUSETTS.

ROSS WINANS *vs.* THE EASTERN RAILROAD CO.

*Interrogatories proposed to Wm. B. Aitken and Stephen Ustick, of Philadelphia, on the part of the Defendant.*

1. State your age, residence, and business or occupation, and where is your shop?

2. Are you or not in the habit of making models of machinery from drawings and specifications?

3. Have you or not made or had made in your shop, a model of the eight-wheel car or carriage, described in a practical treatise on railroads and carriages, by Thomas Tredgold, London, 1825? if yea, will you examine the model A, and say whether it is or is not a fac simile of that made by you or in your shop? if it differs, wherein does it differ? and whether or not is it a true representation of the eight-wheel car described in said publication of Tredgold?

4. Have you or not made or had made in your shop, a model of the six and eight-wheel car or carriage described in the specification and drawings of W. and E. W. Chapman, published in the 24th volume of the Repertory of Arts, in 1814? If yea, will you examine the model K, and say whether it is or is not a fac simile of that made by you, or in your shop? if it differs, wherein does it differ; and whether or not is it a true representation of the six and eight-wheel carriage described in said Chapman's specification?

5. Whether or not have you seen and examined the Patent to Ross Winans, dated Oct. 1, 1834, for improvements in railroad carriages; and have you made or had made, in your shop, a model of the eight-wheel railroad carriage, and especially recommended and described in the specification in said Patent? Is the model marked B, or is it not, a fac simile of the model originally made by you; and whether or not is said model now shown to you, marked B, a true and correct model of the said car, so described and recommended in said specification? if not, in what respects does it differ therefrom?

WILLIAM WHITING, *Solicitor of Def't.*



## UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS, IN EQUITY, vs. EASTERN RAILROAD COMPANY.

*Cross-Interrogatories to Wm. B. Aitken and Stephen Ustick, on behalf of the Complainant.*

X 1. Upon what scale or proportion is the model A, referred to in the 3d interrogatory, constructed, and are all the parts of said model on the same scale? What parts are on different scales; and why did you not adhere to one scale throughout? State particularly.

X 2. Is not the only drawing of an eight wheel car, in the treatise by Tredgold, a side view, in which the wheels are shown as equidistant from each other?

X 3. Will you state the page and quote the language used in said treatise of Tredgold, which directs the wheels of an eight wheel car to be placed otherwise than equidistant, whether in the same or in separate trucks.

X 4. Will you state the page and quote the language in said treatise by Tredgold, which directed you to apply the fixture for the draft to the end of the body of the said model?

5. Under whose direction and at whose request did you make the said original model and duplicate? Were you not directed to place a draw link upon said model in the spot where you have put it, and if so by whom?

X 6. Upon what scale of proportion is the model B made? and if upon more than one, state particularly the parts in each scale, and why one scale was not adhered to throughout?

X 7. What extent of bearing, between the body and trucks, does model B represent; whether more or less than the drawing annexed to the Complainant's Letters Patent?

X 8. Does said model B conform to the drawing annexed to the Complainant's Letters Patent, in relation to the point of draft? If not, wherein do they differ? And why did you not show the point of draft upon the end of the body of the car?

X 9. Did you omit showing the point of draft, by the direction of any person? and if so, by whose direction?

X 10. Have you seen, heard, or had stated to you, any of the foregoing interrogatories, or their substance, and if so, by whom?

C. P. CURTIS, JR., *Solicitor for Complainant.*

## CIRCUIT COURT OF THE UNITED STATES

FOR THE DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAIL ROAD COMPANY.

*Interrogatories proposed to Isaac Dripps, of Bordentown, N. Jersey,  
on behalf of the Respondent.*

1. What is your name, age, residence, and business or occupation, and how long have you been so engaged?

2. Will you describe what kind of cars are in general use on the Camden and Amboy Railroad, how many wheels they have, and if they are in trucks? state the distance between the remotest bearing points of the wheels in each truck upon the rails; describe the said cars in all other essential particulars, and whether or not they are in daily or general use for running on curves or turnouts on said road.

3. Whether or not the curves and switches on said Camden and Amboy road, are about the same as on other roads, and whether or not the said cars are in successful and general use on said road?

WILLIAM WHITING, *Solicitor of Defendant.*

*Cross-Interrogatories in behalf of Complainant.*

X 1. Of what length of radius are the curves on the Camden and Amboy Railroad away from the termini of said road?

X 2. Upon whose plans of construction and arrangement are the passenger cars on said road constructed?

C. P. CURTIS, Jr., *Complainant's Solicitor.*

## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. EASTERN RAILROAD COMPANY.

*Interrogatories proposed on the part of the Respondent*

To Oliver Byrne, of Philadelphia; John C. A. Smith, of Baltimore; Joseph L. Kite, Philadelphia; Jacob Schryack, Baltimore; Geo. W. Smith, Philadelphia; John Edgar Thompson, William Pettit, Septimus Norris, S. M. Felton, Edward Martin, and Richard French, of Philadelphia; A. S. Adams, G. Beach, D. Beggs, A. Bridges, J. H. Andrews, J. W. Brooks, S. Cooper, J. Crombie, C. Davenport, C. E. Detmold, A. Dugan, R. H. Eddy, H. W. Farley, E. French, G. S. Griggs, J. Hayward, W. Higginson, R. Higham Johnson, G. B. King, Geo. Law, E. Lincoln, W. R. Lee, W. J. McAlpine, W. McQueen, C. Minot, W. P. Parrott, D. Pickering, W. T. Ragland, J. R. Van Rensselaer, L. R. Sargent, C. Slaughter, G. Stark, C. B. Stuart, H. Waterman, J. Wilkinson, J. B. Winslow, S. W. Worden, W. C. Young.

1. What is your name, age, place of business, and residence, and profession or occupation?

2. What opportunity have you had for becoming practically or theoretically acquainted with the mechanical principles of machinery in general, and of acquiring practical or theoretical knowledge concerning railroad machinery?

3. Whether or not are you familiar with the mechanical principles of the construction and operation of double truck, eight-wheel railroad cars, used by the Eastern Railroad Company, or those now in general use on the railroads of the United States?

4. Have you examined the specification of the letters patent issued to Ross Winans, dated Oct. 1st, 1834, or a copy thereof, which is here-to annexed? If not, will you examine the same?

[See page 3, and also Appendix.]

5. Have you examined the model now shown to you by the Commissioner, marked B; if not, will you now examine the same, and will you state whether it is or is not a true representation of the car described and recommended in said specification; and if not, in what respects it differs therefrom?

6. So far as relates to the construction, organization and arrangement of the double truck eight-wheel car, now used by the Eastern Railroad, and in common use upon the railroads of the United States,—in order to enable them to run smoothly, evenly and safely over the curves, straight track and irregularities of railroads,—what parts, and what arrangement thereof, are, in your opinion, essential and elemental?

7. Will you state whether the eight-wheel double truck railroad cars, now in general use upon the Eastern Railroad, or upon the roads of this country, have or have not improvements or inventions applied to them, not described in said specification; if so, will you name such of them as you remember?

8. Whether or not are the bodies of the said eight-wheel cars, now in common use, so constructed as to be able to be removed from the trucks whenever desired, by taking out the king bolt? And about how far from the end of the framing of the body is the bolster of the trucks usually placed?

9. Whether or not do said cars have side bearings? If so, why?

10. Whether or not are check chains in use; and if so, for what purpose?

11. Whether or not does increasing or diminishing the length of the body of the said eight-wheel car, while the trucks are placed at the same distance from the ends of the body, introduce any new or different mechanical principles into the organization of the car, or does such change require any exercise of invention?

12. Will you state your opinion as to the practicability and safety of having the axles of the wheels of a passenger car connected by long springs, as described in said specification?

13. Will you examine the drawing of the railroad freight car hereto annexed, and state whether or not the drawing shows a car constructed with running gear in the manner particularly described and recommended in said specification; if not, will you state in what respects they differ?

14. Have you seen and examined the Repertory of Arts, Manufactures and Agriculture, Vol. 24, Second Series, published in London, A. D., 1814, more particularly that part of said volume which includes the specifications and drawings of the patent of William and E. W. Chapman, or a true copy thereof?

[See Appendix.]

15. Have you examined the model marked K, and if so, will you state whether said model truly and correctly represents any railroad car or carriage described and shown in said book and drawings?

16. Whether or not, would a car-builder of ordinary skill and knowledge of his profession, be able, by aid of said specification and drawings, and without the necessity of exercising his own invention, to construct eight-wheel railroad cars substantially the same as those now used by the Eastern Railroad and other railroads generally, so far as respects the manner of arranging and connecting the eight wheels, and the connection of the trucks with the body of the cars?



17. Whether or not has said Chapman's car, as shown in said book and drawings, side bearings, and centre pivot, and rigid rectangular wheel frame?

18. Whether or not is the distance between the bearing points of the wheels about equal to the width of the track? Will you measure the same?

19. Whether or not may this model, now before you, be made to represent both the six and the eight wheel carriage?

20. Have you examined a work called "A Practical Treatise on Railroads and Carriages," by Thomas Tredgold, published in London, England, in 1825, and the drawings therein referred to, or a true copy thereof? And if so, will you state whether or not you have there found any drawings and description of any double truck eight wheel railroad car?

21. If you answer the last interrogatory in the affirmative, will you describe said eight-wheel car; its component parts; the manner in which they are arranged and put together, and the mode in which said car is calculated to operate?

22. Have you examined the model marked A, and whether or not is said model a correct representation of said eight-wheel car of said Tredgold; if not, in what respects does it differ therefrom? Have you examined model marked C, and is it a correct representation of said eight-wheel car of said Tredgold, or of any car described by him; if not, why not?

23. Will you compare the eight-wheel car of said Tredgold with the eight-wheel cars used by the Eastern Railroad, and in general use in this country, so far as regards the running gear; and will you state whether or not, in their mechanical principles and mode of operation, they are or are not substantially identical?

24. If in answer to any preceding interrogatory you have said that the said Tredgold car is calculated to conform to all the irregularities of railroads, will you explain whether or not it is calculated to answer the purposes and objects set forth in said Winans's specification, as designed to be accomplished by him?

25. Have you seen the letters patent of the United States granted to Jonas P. Fairlamb, dated Jan. 19th, 1833, and the drawings and specifications thereof, or a true copy thereof? If yea, will you state what part, if any, of the invention described or claimed in said Winans's said patent is described or shown in said Fairlamb's patent or drawings?

26. Whether or not would a mechanic of ordinary skill in car building, having knowledge of said Fairlamb's patent and drawings, be enabled, without exercising invention, to construct eight-wheel double

truck cars substantially like those used by said Eastern Railroad, or like those now in common use on the roads of the United States : and if so constructed, whether or not would they, in your opinion, or would they not, embody the essential principles of the eight-wheel railroad car in common use, and would they or not attain the beneficial results pretended to be obtained by said Winans in his said patent ?

27. Will you examine the model of the Allen Steam Carriage, marked "Horatio Allen," now shown to you by the Commissioner, and the drawings of said steam carriage, marked G and H, also now shown to you, and will you state what are the mechanical principles of the construction and arrangement of the running part—and whether or not is it calculated to attain the practical benefits of the eight-wheel railroad cars now in general use—and as to the construction and arrangement of the running gear, is it or not substantially the same as these ? Whether or not does it contain the construction and organization necessary to produce the beneficial results stated and claimed to be accomplished in the said Winans's specifications, of October 1, 1834, and what part, if any, of the invention described by said Winans, in said specification, is embodied therein ?

28. Will you examine the model of the eight-wheel double truck railroad car, now before you, marked "G. Bryant," and explain its construction and mode of operation ?

Whether or not is it adapted to pass all the inequalities and curves, as well as the straight track of the roads ?

Whether or not is it constructed and operated upon the same mechanical principles with the cars used by the Eastern Railroad : or with those now in general use on the railroads of the United States : or with the model of the Eastern Railroad cars now shown to you ?

29. Whether or not is any, and if any, what part of the invention described by said Ross Winans, in his letters patent, is embodied in said Quincy car ?

30. Whether or not would a mechanic of ordinary skill and knowledge in building railroad cars, having knowledge of the aforesaid Quincy car, in 1829 or 1830, have been able, at that time, without the exercise of invention of his own, to construct double truck eight-wheel railroad cars, substantially like those now in general use, so far as regards the arrangement of the wheels and the connection of the trucks with the body of the cars ?

31. Have you seen or examined the Treatise of Wood, published in 1825, the Work of Tredgold and that of Strickland, published in 1826, and will you state whether or not, previously to the year 1830, was the mode of drawing railroad cars by a coupling from the middle of the ends of the bodies, well known and publicly used, and shown or described in sundry printed works ?

32. Will you examine the last mentioned printed works, and state as to the distance of the bearing points of the wheels, as compared with the width of the tracks, on the cars which are described or shown in said works: and how the said distance compares with that of the wheels in the best constructed cars now in use in the United States?

33. Whether springs and pedestals, as now used on the eight wheel double truck cars, were or were not applied to the four wheel cars described and shown in the American edition of Wood's Treatise, in 1832, and in said Allen's model?

34. Whether or not, before 1830, was the mode of causing the wheels of railroad cars to revolve with the axles, a well known equivalent for the mode of causing them to revolve *on* the axle-trees: if yea, were these equivalents described and shown in any printed works prior to that date?

35. Whether or not does it, in your opinion, involve any change in the mechanical principles or modes of operation, in said Quincy car, to substitute for the axletrees axles revolving with the wheels?

Or larger wheels, instead of those used, so as to cause the flanges of the wheels, on each truck, to approach very near each other?

Or to draw the said car by the body, instead of drawing it by the truck?

Or to increase the length of the body of the platform?

Or to place a box upon the top of the said platform, so as to become a passenger car?

Or to cause it to run at any greater or less rate of speed?

And would it or not, in your opinion, require invention to make any and all of these changes?

36. Whether or not, in the construction and operation of the double truck eight wheel car, is or is not the distance of the flanges from each other, *of itself considered*, material? And how may that distance be varied without in any way changing the mechanical principles or mode of operation of the car containing them?

37. Whether or not, is the distance of the bearing points, upon the rails, of the wheels in each truck, material and essential to the operation of the cars: if so, why?

38. Whether or not is the maintaining the axles of the wheels, in each truck, at a fixed and uniform distance from each other, material and essential in the construction and operation of the eight wheel car? and will you give your reasons for your opinion?

39. Do you know any fact or circumstance which is, in your opinion, pertinent to the issue between the parties, and beneficial to the Defendant: if so, will you please state the same.

Will you state your opinion as to the correctness or incorrectness of the theory of said Winans, for constructing or arranging the

eight wheel car, as set forth in his said patent: and your opinion as to the practical operation of railroad cars, constructed according to said theory and specification: and what facts or observations, if any, your opinion is founded upon?

WILLIAM WHITING, *Defendant's Solicitor.*

## UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS vs. THE EASTERN RAILROAD CO.

*Cross-Interrogatories by the Complainant to Oliver Byrne and J. W. Brooks and others.*

X 1. What experience have you had in the construction, arrangement or examination of machinery?

X 2. Have you been particularly conversant with the construction of the running apparatus of railroad cars or carriages, or have you paid any, and what attention thereto, and in what capacity, and for what period of time, and in what way?

X 3. Have you ever been examined as an expert in Courts of Justice in patent causes, and if yea, how many times and upon what class of subjects?

X 4. Have you been accustomed to any, and what extent, to the examination and comparison of machinery, with a view to forming and expressing or acting upon an opinion as to the substantial identity between two or more machines or combinations of apparatus? If so, state the extent to which you have practised such examination and comparison, and the subjects with which you have been conversant in this respect.

X 5. If you shall have stated that you are a Civil Engineer, Superintendent, or other officer or employe of any railroad, state whether it has been any part of your duty or employment to attend to the construction and arrangement of the running gear of railroad cars or carriages?

X 6. Are you theoretically and practically acquainted with railroad engineering, and do you fully understand the principles involved in the construction and operation of railroad cars of various kinds, and the properties essential to their proper operation under the present condition of railroad construction and engineering, and have you such a knowledge of the subject as will enable you to compare the different construction of cars, and to judge therefrom whether they are practically adapted to answer the purposes required of railroad cars, under the conditions of high rates of speed, steadiness of movement, and the curvature and irregularities of the road commonly found in the working of railroads in this country?



X 7. Is it or not your opinion as a practical engineer, that it is important and essential to the proper operation of an eight-wheel car that it should be able to move round curves in the road with the least practicable friction between the flanches of the wheels and the rails?

X 8. Will not the friction between the flanches of the wheels and the rails, be proportionate to the resistance which the wheels offer to the guidance of the rails? If not, why not?

X 9. Will not the wheels of a four-wheel car, or of a truck of an eight-wheel car, run upon a curve with less friction between the flanches and the rails, the nearer the axles of the wheels are to each other, and for the reasons set forth in the said Winans's specification?

X 10. Will not the wheels of the trucks of an eight-wheel car, independently from other considerations, run upon the curve, and over the irregularities of the road, and yield to the guidance of the rails, with the least friction when the trucks have the greatest freedom of motion?

X 11. Are you sufficiently acquainted from personal knowledge, reading or otherwise, with the state of railroad engineering at and before the date of said Winans's patent, and particularly prior to 1830, to compare the present advanced state of railroad engineering with what then existed? state your means of knowledge particularly.

X 12. In your opinion, is it not important or essential to the running of cars at high speeds, such as have been practised since the time of said Winans's invention, that they should be made in such a manner as to insure greater steadiness of motion than was attained by the four-wheel cars? Is it or not your opinion, that making the car-body of great length as compared with the modes before practised, and supporting the same at or near its ends, are essential to the attainment of greater steadiness of motion at high velocities, than could be obtained by the four-wheel cars as formerly constructed?

X 13. Is it or not, in your opinion, essential to the proper construction of an eight-wheel car, that it shall have the capacity to work with other cars in a long train, and in any part of the train in which it may be placed?

X 14. Is it or not important and essential to the proper working of the first car in a train, that while it is subjected to the whole draft of the train, its trucks shall have the same freedom of motion that any other trucks in the train have?

X 15. Is it not essential in order to give freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them?

X 16. Does the model B truly represent the car described in the Plaintiff's patent, in the extent of bearing surface between the bolsters, as shown in the drawing attached?

X 17. Does the model B show the mode of attaching the draft as is represented in the drawing of the Plaintiff's patent.

X 18. Is any particular form of spring, or mode of constructing the framing of the truck, described by the Complainant in his specification as an essential part of his invention?

X 19. Do you consider the use of springs essential to the proper construction of an eight-wheel car?

X 20. Does either the description or drawings of the "Chapman Engine," inquired of in the 14th direct interrogatory, represent *any* railroad car like model K, or does it represent any railroad car whatever, using language in its ordinary acceptance? If it does, quote the language and point out the drawing which describe and represent it. Please point out the manner in which the draft was applied to it.

X 21. In the drawings and description in the treatise by Thomas Tredgold, of a carriage with eight wheels, is there any representation or description of a draw-link attached to the end of the body, as is shown in the model A? If so, please quote the language and point out such description.

X 22. Is there any description or drawing in said Tredgold's Treatise, of any provision for enabling the trucks or wheel frames of said car with eight wheels, to swivel laterally, to conform to the curves of the road? If so, please to point it out particularly.

X 23. If, in answer to the 27th direct interrogatory, you say that any part or parts of the said Winans's invention is embraced in the model or drawings of the Allen Steam Carriage, point them out particularly, and quote the language of said Winans's specification in which such parts are described.

X 24. If, in answer to the 29th direct interrogatory, you say that any part or parts of the invention of the said Winans is embraced in the said Quincy car, please state particularly what parts, and quote the language of the specification of said Winans, in which such parts are described.

X 25. With your knowledge of what was the state of railroad engineering and science, in 1829 and 1830, would a mechanic of ordinary skill, having all the knowledge possessed by the world at that time about the construction of cars, have known what the requirements and characteristics of a railroad passenger car must have been to enable it to move safely and smoothly over the curves and irregularities of a railroad, as then or now constructed, at a rate of thirty miles per hour, and to perform the duties required of the ordinary eight wheel cars now in use? If so, from what source or sources could he have derived his knowledge? Please answer this interrogatory fully and particularly.

X 26. Do you or not consider the arrangement of railroad car-wheels

fixed firmly to their axles, and rotating with them, to be the same in principle as those rotating loosely upon fixed axles?

X 27. Do you know where the draft was applied to the "Quincy car"? If yea, state at what point particularly it was applied.

X 28. Do you or not consider it a matter of indifference whether the draft be applied to the truck or the body of the car?

X 29. Were not the cars described in the works of Wood, Tredgold and Strickland, referred to in the 31st Int., as having the draft applied to the middle of the ends of the body, four wheel cars? and were not the wheels attached to the said body?

X 30. In every instance that has come to your knowledge as existing prior to the invention of the Complainant, in which eight wheels were employed, arranged in bearing carriages or trucks to sustain an independent body, has not the draft been represented as applied to the truck instead of the body, when any mode of applying the draft has been shown? If not, state particularly the instances in which the draft has been applied to the body, and give your authority for such, fully.

X 31. Would the drawings or description of the "Chapman Engine," referred to in the 14th direct Int., or the drawings or description in Tredgold's Treatise, referred to in the 20th direct Int., or the drawings or model of the Allen locomotive, referred to in the 27th direct Int., or the model of the Quincy car, or either or all of them, teach a mechanic of ordinary skill and knowledge in the construction of cars, in the year 1830, that placing the wheels of the trucks very near together, would reduce the friction between the flanches of the wheels and the rails over curves? If yea, point out particularly where, and quote the language conveying such information.

X 32. Would the same drawings and descriptions have taught such a mechanic, in the year 1830, that great stability of motion, when running at high velocities, could be attained by constructing the car-body of great length, and supporting it at, or near each end, upon two trucks thus constructed? If yea, point out particularly where, and quote the language, if so described.

X 33. Would the same drawings and descriptions have taught such a mechanic, in the year 1830, that, in order to move over the curves and irregularities of a railroad at a high velocity, with safety and stability of motion, and with the least practicable friction on the rails, that the trucks should have the greatest possible freedom to conform to the surface of the rails, and should not be constrained by the draft? If yea, please point out where, and quote the language fully.

X 34. Is there in the drawings and descriptions aforesaid, any description of, or allusion to any arrangement or modification in the construction of railroad cars, by which they might be run at high velocities, such as have been practised since 1830?

X 35. Is not the purpose, shown and expressed in the drawings and descriptions before referred to, of the employment of eight wheels in a car or carriage, solely for the purpose of carrying great weights, and dividing the weight equally on eight wheels, in order not to place a greater load on each wheel than they and the rails could well bear? If not, point out the exceptions and quote the language to the contrary.

X 36. So far as your knowledge extends, were such eight wheel cars or carriages employed previous to the year 1830, except to carry weights that could not be subdivided and carried upon four wheel cars? If yea, state particularly where, and quote your authority.

X 37. Have you been employed by any person or persons, corporation or corporations, to assist in the preparation of the defence of this case, or to collect evidence to impeach the validity of the patent of Ross Winans, in controversy in this suit; or are you in any way connected with this case, excepting as a witness summoned to testify under the present commission, or interested in any and what way in the result of this controversy?

X 38. Are you connected in any and what way, with any and what railroad company; and if so, does such company make use of eight wheel passenger or freight cars or carriages upon its road?

X 39. Have you formed an opinion that the letters patent of Ross Winans, now in controversy in this case, are invalid for want of novelty or originality? If so, state whether you formed such an opinion or any opinion upon this subject before you examined the letters patent of said Winans, and compared the alleged invention therein described with the previously existing cars or carriages, or descriptions inquired about in the direct interrogatories, or after such examination and comparison. Did you ever converse with any and what person, upon the subject of the novelty or originality of the said alleged invention of Ross Winans before you made an examination of the letters patent, and the comparison above inquired of?

X 40. If you shall have stated that you are a railroad superintendent, state whether you are a member of any and what association of railroad superintendents, and if so, state whether that body or a committee thereof, have since or before, and which, the commencement of this suit, taken any and what action in reference to defending the same, or aiding in the defence thereof, or for the purpose of collecting evidence to impeach the validity of Ross Winans's patent aforesaid, and whether you are a member of such committee, and if so, whether you have instructed, or aided, or consulted with the counsel or solicitor for the Defendants, in the preparation of the defence.

X 41. Have you seen, heard, or had stated to you, the substance of the foregoing interrogatories, or any of them; and if so, by whom were they shown or stated to you?

C. P. CURTIS, JR., *Complainant's Solicitor.*



## UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS vs. THE EASTERN RAILROAD CO.

*Further Interrogatories to be addressed, on the part of the Respondent, to the same Witnesses named in the Direct Interrogatories to Oliver Byrne and ten [?] others.*

*Re-direct* 1. If you know of any fact or circumstance tending to show whether or not the eight-wheel car now in common use on railroads, was used with the knowledge of said Winans, and without objection or claim thereto on his part, will you state the same?

*R. 2.* If you have answered the 35th and 36th cross-interrogatories, will you state whether or not, in your opinion, would it introduce any new mechanical principle, or any new mode of operation, into the Chapman, Tredgold, Allen, or Quincy cars or carriages, if (instead of the bodies or platforms now shown or described) you should substitute longer bodies,—retaining the same trucks or bearing carriages, and placing them under the body thus substituted at the same distance from the respective ends thereof?

*R. 3.* Would it, or would it not, in your opinion, require invention to make that substitution?

*R. 4.* Whether or not is there any thing in the descriptions or drawings of the said Tredgold car or carriage, which renders it essential that all the wheels shall be equidistant from each other; and whether or not, if two trucks are placed remotely from each other, under one body, by the substitution of a longer body, is there any thing in such remoteness of the trucks from each other, inconsistent or incompatible with the said description or drawings, or with the objects and purposes set forth by said Tredgold in his said treatise?

*R. 5.* Will you answer the same question in relation to the Chapman car or carriage, and the Chapman patent?

*R. 6.* Will you answer the same question in relation to the Allen steam carriage?

*R. 7.* Will you state whether or not there is any thing in the said Quincy car, (judging by the model thereof, and what you know of its structure and uses and mode of operation), which renders it essential that all the wheels thereof should be equidistant from each other, under one body? And would the change of a longer instead of a shorter body, (so that the same trucks should be coupled by the body remotely from each other, while the body should be supported at or near the two ends,) be in any wise inconsistent or incompatible with the objects and purposes for which the Quincy car is designed and used?

*R. 8.* If you have answered the 9th cross-interrogatory, will you express your opinion, whether or not there is any difference between

the mechanical theory, according to which said Winans in said specification, recommends and claims the arrangement of the wheels, and the connection thereof with the body; and that mechanical theory on which the running gear of the eight-wheel cars now in common use is arranged and connected with the body? And whether or not is such difference essential?

*R. 9.* Whether or not, according to the specification of said Winans, is it necessary, in order to accomplish the purposes claimed and stated by him, to use or employ very long bodies?

*R. 10.* If you have answered the 33d cross-question—whether or not is it essential to the proper and safe construction of eight-wheel cars for rapid travelling, that the trucks should have the greatest possible freedom of swivelling to conform to the surface of the rails?—will you answer the question fully, and give such illustrations as you deem fit?

WILLIAM WHITING, *Respondent's Solicitor.*

# UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

*Plaintiff's Cross Interrogatories, in addition to the original Cross Interrogatories to OLIVER BYRNE and ten [?] others.*

*XX 1.* If you have answered the eighth additional-interrogatory by the Defendants, please state fully and precisely what you consider to be the theory of the Plaintiff therein referred to?

*XX 2.* What was the average rate of speed upon railways prior to 1830; and for what purposes were railways principally used prior to that date?

*XX 3.* In what manner were railways constructed prior to 1830; were they not constructed of such materials and in such way that distribution rather than concentration of the weight of the cars and of the locomotive was required?

*XX 4.* Was there more than one railway in England, prior to 1830, upon which passengers were habitually carried? If yea, what and when were they?

*XX 5.* Was not the use to which railways, prior to that time, were habitually put, in the course of their regular business, the transportation of trains of merchandise, by horse power; or how otherwise?

*XX 6.* Was not the average speed six miles per hour prior to that date?

*XX 7.* Have you ever designed railroad cars? if so, what kinds; and give the date of each car so designed by you, and upon what roads they were placed?

C. P. CURTIS, JR., *Solicitor for Complainant.*

## DEPOSITIONS

*Of Witnesses produced, sworn or affirmed, and examined, on the part of the Defendants, on sundry days between the first day of November, A. D., 1853, and the nineteenth day of December, A. D. 1853, in the city of Philadelphia, under and by virtue of a Commission issued out of the Circuit Court of the United States in and for the Massachusetts District, in a certain cause therein depending, wherein Ross Winans is the Plaintiff, and the Eastern Railroad Company is the Defendant.*

1853, NOVEMBER 1st. William B. Aitken, of the City of Philadelphia, in the State of Pennsylvania, pattern and model maker, being produced, sworn and examined, on the part of the Defendant, deposes as follows:

## DEPOSITION OF WILLIAM B. AITKEN.

1. To the first interrogatory, on the part of the Defendant, he answers as follows:

My age is twenty-nine years; my residence is in Philadelphia; my business or occupation is that of a pattern or model maker; and my shop is [at the north-west corner of Second and Dock streets, in said city, formerly the shop of Stephen Ustick.

2. To the second interrogatory, on the part of the Defendant, he answers as follows:

I am constantly making models of machinery from drawings and specifications.

3. To the third interrogatory, on the part of the Defendant, he answers as follows:

I have made a model of the eight-wheel car, or carriage, described in the treatise of Thomas Tredgold, referred to. The model A, now shown me, is the model that I made; I made it in Mr. Ustick's shop. This model A is a true representation of the eight-wheel car described in said publication of Tredgold.

4. To the fourth interrogatory, on the part of the Defendant, he answers as follows:

I have made a model of the six and eight-wheel car or carriage, described in the specification and drawings of W. & E. W. Chapman, published in the 24th Volume of the Repertory of Arts, in 1814. The model K, now shown me, is the model that I made; I made it in Mr. Ustick's shop. It is a true representation of the six and eight-wheel carriage described in said Chapman's specification.

5. To the fifth interrogatory, on the part of the Defendant, he answers as follows:

I have seen and examined the patent to Ross Winans, dated October 1, 1834, for improvements in railroad carriages. I have made a model of the eight-wheel railroad carriage, and especially recommended and described in the specification in said patent. The model B, now shown me, is the model that I made; I made it in Mr. Ustick's shop. It is a true and correct model of the said carriage, so described and recommended in said specification.

X 1. To the first cross-interrogatory, on the part of the Plaintiff, he answers as follows :

The model A, referred to, is constructed on a scale of one inch to the foot, relative to a full sized car. All the parts of said model are upon the same scale. In making it I adhered to the scale of one inch to the foot in all its parts.

X 2. To the second cross-interrogatory, on the part of the Plaintiff, he answers as follows :

The only drawing of an eight-wheel car, in the treatise of Tredgold, is a side view, in which the wheels are shown as equidistant from each other.

X 3. To the third cross-interrogatory he answers as follows :

I cannot find any one page in particular that says that the wheels of an eight-wheel car shall be placed otherwise than equidistant. But, taking that portion of his treatise which relates to eight-wheel cars, as a whole, I am of opinion that the wheels of cars constructed in accordance with his views, would not, in long lengths of car, be equidistant, the trucks preserving the same distance from the end of the body of the car, in large cars as in small cars.

X 4. To the fourth cross-interrogatory, on the part of the Plaintiff, he answers as follows :

I do not find any language in the treatise of Tredgold directing the application of the fixture for the draft to the end of the model. But such fixture is to be found in *Plate 1, Fig. 1*, which is attached, and forms a part of his treatise, and which indicates the mode of draft.

X 5. To the fifth cross-interrogatory, on the part of the Plaintiff, he answers as follows :

The model was made at the request of W. W. Hubbell, Esquire. The only directions given to me were by Mr. Hubbell, and these were, to make the model in accordance with the drawing and descriptions in Tredgold's treatise. The draw-link was placed on the model by myself, because I found it in *Plate 1, Fig. 1*, of the treatise on a draft of a four-wheel car.

X 6. To the sixth cross-interrogatory, on the part of the Plaintiff, he answers as follows :

The model B is made upon a scale of one inch to the foot, relative to a full sized car. All the parts of said model are on the same scale. In making the model I adhered to the scale of one inch to the foot throughout.

X 7. To the seventh cross-interrogatory, on the part of the Plaintiff, he answers as follows :

The extent of bearing between the body and trucks, represented by model B, is thirteen inches in length, by nine in width. This is less than that of the drawing annexed to the Complainant's Letters Patent, and attached to this Commission. I constructed the model B from the specification of the Patent referred to, and which, in my opinion, I desire to add, describes a different car from that represented in the drawing.

X 8. To the eighth cross-interrogatory, on the part of the Plaintiff, he answers as follows :

The model B does not conform to the drawing referred to in relation to the point of draft. There is no point of draft indicated on the model, and there is a point of draft represented in the drawing. I did not show



the point of draft in the model, because I made the model from the specification of the Complainant's Patent, and not from the drawing referred to.

X 9. To the ninth cross-interrogatory, on the part of the Plaintiff, he answers as follows :

I did not omit showing the point of draft by the direction of any person. I made the model at the request of W. W. Hubbell, Esquire ; Mr. Hubbell directed me to make the model according to the *specification* of the Complainant's Patent, and I did so, to the best of my ability.

X 10. To the tenth cross-interrogatory, on the part of the Plaintiff, he answers as follows :

I have neither seen, heard, nor had stated to me any of the interrogatories contained in this Commission, nor the substance of the same, save by the Commissioner, at my examination.

WM. B. AITKEN.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Comrs.*

## DEPOSITION OF ISAAC DRIPPS.

DECEMBER 9, 1853. Isaac Dripps, a witness produced, sworn and examined, on the part of the Defendants, saith, in answer to interrogatory first :

I. My name is Isaac Dripps, aged 43 years, I reside in Trenton, N. J., machinist, and am now engaged in manufacturing machinery ; I have been so engaged since last May, 1853. Previous to that time I was employed by the Camden and Amboy Railroad Company, as Superintendent of Repairs and Machinery on the road, which position I held since 1831, a period of nearly twenty-two years.

To the second interrogatory he saith :

II. The cars in general use on the Camden and Amboy Railroad, are long cars for passengers, and are generally from forty to forty-five feet long ; they are fitted up in the best manner as to strength, regard being had to the comfort and safety of passengers. They have generally twelve wheels, six wheels in each truck, and the distance from the remotest bearing points of the wheels in each truck upon the rails, is about five feet six inches. The distance from the end of the car to the centre pivot of the truck, is about seven feet, some are more and some less, but this measurement is the average distance, and the cars now being built, are so built. The frame that the wheels work in, is a rigid rectangular frame, furnished with guide plates or pedestals, to keep the shafts or axles parallel to each other, and are also furnished with springs, to give easy motion to the car. Each car has at its end a draw link, at the end of the body of the car. Those cars are in general and extensive use, for running on curves and turnouts on said Camden and Amboy Railroad. These twelve-wheel cars are exclusively used in the through trains.

To the third interrogatory he saith :

III. The curves and switches on the Camden and Amboy Railroad, are about the same as on other roads. There are some short curves

on the road—say about 400 feet radius. The said cars are in successful operation, and pass over these short curves daily.

To the first cross interrogatory, on the part of the Defendants, he saith :

X I. The length of radius of the curves on the Camden and Amboy Railroad, away from the termini of said road, is from 400 feet to a straight track. The curve of 400 feet radius, to which I allude, is at Bordentown. This I believe to be the shortest curve upon said road. The through lines between New York and Philadelphia, via Camden and Trenton, pass that curve twice in each day. The cars generally used, are the twelve-wheel cars, before described and referred to.

To the second cross interrogatory he saith :

X II. The passenger cars in use on said road, were constructed and arranged by Mr. E. A. Stevens, and were built under his superintendence and direction, at the Company's shop, at Bordentown. Some four of the cars in use on that road, were built away from the shop, and they were built upon a plan furnished the builder. These cars were twelve-wheel cars.

ISAAC DRIPPS.

CHAS. B. HEAZLITT,

ROBERT P. KANE, *Comr's.*

#### DEPOSITION OF SEPTIMUS NORRIS.

NOVEMBER 9, 1853. Septimus Norris, a witness on the part of the Respondent, being duly sworn, saith, in answer to interrogatory first :

*First.* My name is Septimus Norris, aged about thirty-five years, place of business in Philadelphia, residence in Philadelphia, and by profession a civil and mechanical engineer.

In answer to the second interrogatory he saith :

*Second.* My profession, originally, was that of civil engineer, and for the last fourteen years builder of locomotives ; and this, of necessity, has given me a practical knowledge of mechanics, and of railroad machinery. For the last twenty years I have been engaged in the manufacture of locomotives ; originally as civil engineer.

In answer to the third interrogatory he saith :

*Third.* I am familiar with the construction and operation and mechanical principles of the eight-wheel car used by the Eastern Railroad Company, and those in general use on the railroads of the United States.

In answer to the fourth interrogatory, he saith :

*Fourth.* I have examined the specification of the letters patent issued to Ross Winans, dated October 1, 1834, a copy whereof is annexed to the commission, and understand the same.

In answer to the fifth interrogatory, he saith :

*Fifth.* I have examined the model shown me by the Commissioner, marked B, and identified with my signature. It is a true representation of the car described and recommended in said specification. It does not differ in any respect therefrom.

In answer to the sixth interrogatory, he saith :

*Sixth.* The essential characteristics are, two trucks under one body ;

the body to be of sufficient length to allow the trucks to pivot, without coming in contact with each other. The trucks should be placed far enough apart to support the body upon the trucks; in practice, they are generally placed seven or eight feet from the end of the platform. The trucks should have four wheels each, held in rigid wheel frames, that are securely braced to keep them square. The distance between the centres of the truck wheels, should be about equal to the width of the track or distance between the rails, so that the bearing points of the wheels should form a square on the rail, from one bearing point to the other. The middle or centre of each truck must have a king bolt connection with the body, and the body must have side bearings on the truck frame, to steady itself, and prevent side rocking when in motion. The distance between the bearing point of the wheels is the essential and elemental feature. The distance between the flanges is not essential or material, but results from the diameter of the wheels and the distance between the bearing points on the rails. It is the action of the bearing points of the wheels upon the track, and the reaction of the track upon those bearing points, which govern and control the motion of the car upon the rails.

In answer to the seventh interrogatory, he saith :

*Seventh.* The eight wheel double truck railroad cars, now in general use upon the Eastern Railroad and upon the railroads of this country, have many improvements and inventions applied to them, not described in Mr. Winans's specification. They have rigid, square sided wheel frames to the trucks, pendulum or swinging bolsters, male and female transom plates for the trucks to pivot upon; have pedestals and springs to allow the axles to move vertically, and still retain their parallelism with each other, and the wheels square on the track. Some cars have India rubber springs, air-springs, patent lubricating boxes, patent soft metal bearings, patent safety beams in the truck frame to hold it up if an axle breaks; improved brakes, changing backs to the seats, ventilators, draw spring couplings, and patent car wheels. The car bodies more than double the length of the car described in Winans's patent, and about five times the length of the ordinary four-wheel car. None of these improvements are described in said specification. These are all that I now remember.

In answer to the eighth interrogatory, he saith :

*Eighth.* The bodies of the eight-wheel cars now in use are constructed and attached to the trucks, so that by removing the king bolts the body can be lifted up and removed from the trucks, or the trucks taken away from the body. The bolster of the trucks is usually placed about seven or eight feet from the end of the framing of the body, and about four feet from the end of the box part of the body.

In answer to the ninth interrogatory, he saith :

*Ninth.* Said cars usually have side bearings, either friction rollers or slides, to keep the body steady when in motion, and prevent side rocking.

In answer to the tenth interrogatory, he saith :

*Tenth.* Check chains or safety chains are in use, to prevent the trucks from slipping under the body, and from turning round sidewise in case it runs off the track.

In answer to the eleventh interrogatory, he saith :

*Eleventh.* Increasing the length and strength of the body, and leaving the trucks to occupy their position under the ends of the body, involves no invention; the principle is the same in a smaller or shorter car. It is not invention to make a long car on the same principle as a short one. No new or different mechanical principles are involved, and a long long car thus made would operate upon the same principles as the short car.

In answer to the twelfth interrogatory, he saith :

*Twelfth.* Constructing a truck, connecting the axles of the wheels by a steel spring, as described in said patent, instead of using a rigid rectangular wheel frame, would be unsafe in a passenger car, and unfit for practical use.

In answer to the thirteenth interrogatory, he saith :

*Thirteenth.* I have examined the drawing of the railroad freight car annexed to the commission. The drawing does not show a car constructed with running gear, in the manner particularly described and recommended in the said specification. This drawing represents a freight car, and not a passenger car, and represents a rigid rectangular wheel frame for the trucks. In the specification, instead of a rigid wheel frame, the axles of the wheels were connected only by a steel spring, bolted to the boxes of the axles, with a bolster bolted across to the tops of the springs. The drawing represents two springs on each side of the truck frame, the action and re-action of which may not tend to throw the axles of the wheels out of parallelism. The specification particularly recommends one spring only, on each side of the truck, to connect the axis of the wheels, and the action of that spring would necessarily throw the axis out of parallelism. The drawing represents the springs with the shorter curves downwards; the specification directs exactly the reverse. In the drawing, the bolsters on which the body rests, are placed between four and six feet from the ends of the platform of the car, whereas the specification requires the same to be placed at, or near, or beyond, the ends of the body; and in any event, no farther under the body than that the wheels shall come just within the ends; and the trucks are to be coupled as far from each other as can be conveniently done for the support of one body. In the drawing, the wheels are placed sufficiently far apart to put a brake in between them, while in the specification the wheels are directed to be as close as possible, without the flanges touching; to have them act as near as may be like a single wheel. The drawing represents a conical pivot, marked X, with sockets and side bearings, forming a solid bolster in one solid piece, with a lower bolster and socket, Y, to correspond; while the specification describes a plain bolster of wood or iron, reaching across from spring to spring, united to an upper bolster by a king bolt, swivelling in the manner of the front bolster of a common road waggon. The drawing shows a mode of coupling or drawing the car by two pieces bolted across the bottom frame, and a coupling bolt, with a ring to it to drop through the coupling, to draw the car from the middle of the end of the body; the specification does not describe or intimate any mode whatever by which the cars are to be drawn. The drawing shows cast-iron pockets for the ends of the springs to work in; the specification prescribes a different mode of fastening the ends of the springs, that is, by bolting the ends of them



to the ends on to the boxes of the axles. The drawing shows an arrangement of brakes suited to the swivelling trucks of the eight-wheel car; the specification does not describe or mention any mode of arranging or using brakes.

In answer to the fourteenth interrogatory, he saith :

*Fourteenth.* I have seen and examined the Repertory of Arts, Manufactures, and Agriculture, Vol. 24, Second Series, published in London, 1814, and more particularly that part of said volume which includes the specifications and drawings of the patent of William and E. W. Chapman.

In answer to the fifteenth interrogatory, he saith :

*Fifteenth.* I have examined model marked K, and have identified it with my signature. It is a true representation of the Chapman car, described in the specification and drawings in said book. It is an eight-wheel car, and it can be changed, as by direction in the specification, to make the six-wheel carriage.

In answer to the sixteenth interrogatory, he saith :

*Sixteenth.* A car builder of ordinary skill and knowledge of his profession, would be able to construct the eight-wheel cars now in general use, in all their essential principles, from Chapman's specifications and drawings, and without the necessity of exercising his own invention. The car described by the Chapmans has the rigid square wheel frames, with side bearings and king bolts to support the body and allow the trucks to swivel to the curves and irregularities of the road. The bearing points of the wheels are equal in distance apart on the rails, the same as the gauge of the truck; the axles are held parallel, and the wheels square on the truck. Two of these trucks support one body to form the eight-wheel car; the running gear should be placed at or near the ends of the body, which is always the position of all swivelling running gear, of all sorts of carriages, well known to coach and car builders.

In answer to the seventeenth interrogatory, he saith :

*Seventeenth.* Chapman's car, as shown in said book and drawings, has side bearings and centre pivots, and rigid rectangular wheel frames.

In answer to the eighteenth interrogatory, he saith :

*Eighteenth.* I have measured the distance between the bearing points of the wheels; it is equal to the width of the track.

In answer to the nineteenth interrogatory, he saith :

*Nineteenth.* The model now before me, marked K, may be made to represent both the six and the eight-wheel carriage.

In answer to the twentieth interrogatory, he saith :

*Twentieth.* I have examined a work called "A Practical Treatise on Railroads and Carriages," by Thomas Tredgold, published in London, 1825, and the drawings therein referred to, and find there a description and drawing of an eight-wheel and double truck car.

In answer to the twenty-first interrogatory, he saith :

*Twenty-first.* It consists of a car body, double the usual length of the four-wheel cars; two four-wheel trucks, each truck having four wheels, united by a rigid rectangular wheel frame, and the middle or centre of the said truck being united to the body by means of a swivel and bearing, which will allow the truck freely to swivel, and easily to pass all the curves and irregularities of a railroad. The points at which said swivel and bearings support the body, are so far distant from each other as to

allow the trucks not to interfere with each other, while they are, at the same time, protected from collision in trains by the ends of the body projecting beyond them. The distance of the bearing points of the wheels from each other would be about equal to the gauge or width of the track they are intended to run upon. Assuming the track to be of ordinary width, and the wheels to be of the ordinary diameter, the drawings and descriptions plainly show that the truck is to swivel horizontally. Cars thus constructed are calculated to adapt themselves to all the curves, straight track, and irregularities of railroads, and to pursue a steady and safe course on the track, superior to the ordinary four-wheel car.

In answer to the twenty-second interrogatory, he saith :

*Twenty-second.* I have examined the model marked A, and identified it with my signature. It correctly represents the said eight-wheel car, described and shown in the drawing, in Tredgold's Treatise. It does not differ in any respect. I have examined model marked C, and identified it with my signature. It is not a correct representation of said eight-wheel car, of said Tredgold, or of any car described by him. The one marked C, has no vertical pivot or axis for the frame to turn on; it has a cross axletree running through the side piece, which destroys its strength, and will not allow it to conform to the curves and other inequalities of the road, nor will it allow it to perform the function of an eight-wheel car, as required by Tredgold, as it would not turn between the rails, when the wheels encountered inequalities, and would not turn to suit a change of level on a curve of double curvature, as indicated by Tredgold's description. The wheel frame spoken of by Tredgold, is the same kind as before described by Chapman; that is, a regular wheel frame, having the usual middle cross piece and king bolt; the cross piece is secured by a joint bolt, as shown in the drawing of Tredgold.

In answer to the twenty-third interrogatory, he saith :

*Twenty-third.* I have compared the eight-wheel car of said Tredgold, with the eight-wheel car used by the Eastern Railroad, and in general use on the Eastern roads; they do not, so far as regards the running gear, essentially differ in their mechanical principles and mode of operation; they are identical.

In answer to the twenty-fourth interrogatory, he saith :

*Twenty-fourth.* The said Tredgold car is calculated to conform to all the irregularities of railroads, and it is calculated to answer the purposes and objects set forth in said Winans's specification, as designed to be accomplished by him.

In answer to the twenty-fifth interrogatory, he saith :

*Twenty-fifth.* I have seen a certified copy of the letters patent, granted to Jonas P. Fairlamb, January 19, 1833, and the drawings and specifications thereof. In the said drawings of Fairlamb, are clearly shown the peculiarities claimed in said Winans's patent, excepting that the axles of the wheels are borne by a rigid rectangular frame, and not connected together by yielding springs. The closeness of the flanges of the wheels in each truck is there shown; the flanges being represented as but a very few inches apart. The trucks are constructed in two ways; one allows the axis of the wheel a certain limited motion in the truck frame itself, with a view of allowing it to conform to sharp

curves, as represented in figure 1 and 2; while the other truck, in figure 2, is constructed in the ordinary manner, allowing no play to the axis. Each of these trucks swivel under the body by means of large transom plates, and are placed near the ends of the body of the car. Fairlamb's drawings embrace all Winans's arrangement. One of the trucks in figure 2, allows the axles to play; in the other truck is the rigid wheel frame, holding the axles parallel, as is the case in cars in general use. As regards the near coupling the wheels in each truck, and the remoteness of the trucks from each other, it is identically the same as Winans's.

In answer to the twenty-sixth interrogatory, he saith :

*Twenty-sixth.* A mechanic of ordinary skill in car building, having knowledge of said Fairlamb's patent and drawings, and *adopting the truck in figure 2, which holds the axles parallel, and omitting the apparatus which permits the axles to vibrate*, and constructing both trucks alike, with parallel axles, would be enabled, without exercising invention, to construct an eight wheel double truck car, substantially like those in common use, excepting that the wheels in each truck would be closer together than those in general use, thereby more resembling the arrangement claimed by Winans, and embodying the essential principles of the eight wheel car in common use. They would obtain the beneficial results pretended to be obtained by Winans, in his patent.

In answer to the twenty-seventh interrogatory, he saith :

*Twenty-seventh.* I have examined the model of the Allen steam carriage, marked "Horatio Allen," now shown me by the commissioners, and identified with my signature; the drawings of the said carriage are not shown me. The said steam carriage is borne by two trucks, each truck has four wheels in a rigid rectangular wheel frame, which preserves the parallelism of the axis. The points at which the wheels bear upon the rails, are about equal to the width of the gauge of the track, which distance is the most beneficial in actual use. The trucks for locomotives were formerly constructed with the centres of axles closer together than the gauge of the track. *About eighteen months ago I increased the distance between the centres of wheels, about equal to the gauge of the track*, and the practical result has been, that the engines run far more steady than with the truck in former use; the principle I speak of is shown in the drawing marked L<sup>2</sup>, hereto annexed. The truck frames, united at the axis of the wheels, by means of springs and pedestals, similar to those now in general use, which, while it gives ease of motion to the burthen carried, effectually prevented the axis from, at any time, losing their parallelism, by confining the motion allowed by these springs, at all times, to planes perpendicular to the track, and equidistant from each other. Thus the wheels were always kept square on the track. The fore and hind wheels of the truck were of different diameters, but this fact is immaterial. Each truck had a bolster running across the centre of the same, from side to side, and this bolster was connected with an upper bolster, on which the steam carriage rested by means of a large swivel and pivot, or king bolt, operating also as a transom plate, and the truck swivelling readily and freely to the curves and other inequalities of the road. There were also anti-friction rollers, or bearings, upon each



side of the truck, to keep the body of the steam carriage from rocking, and assist in supporting it. The two trucks were placed so near the ends of the steam carriage, that the ends of the truck frames projected beyond the body, and this position was best calculated to sustain the weight of the body; a part of the body hung down between the two trucks. The body of the steam carriage was long, so that it readily rested on two four wheel trucks, allowing them to swivel to the curves, without interfering with each other; and the distance of the bearing bolsters was nearer to the ends of the body, than the position now usually adopted in passenger cars, to the end of the body platform. The said steam apparatus may be taken off, leaving the bolsters and all other parts as they were, and a platform or body for passengers substituted, without invention; and this carriage would then, as it did before, combine all the mechanical elements of the eight wheel passenger car, as ordinarily used, embodied in a manner exceedingly well adapted to pass smoothly and readily over the straight track as well as the curves and irregularities of railroads, and contains all the most essential features of the running gear now in general use, and is better calculated to obtain the objects described in said Winans's specification, than the mode of arrangement which is recommended in the patent itself. The whole of the objects or beneficial results set out in said Winans's patent, and much more, are embodied in said Allen's steam carriage. Winans, by his patent of October 1, 1834, claims the cross centre piece and bolster, connected by means of the pivot, to allow the trucks to move sidewise upon the road; he also uses two trucks which move upon their centre. These are all to be found in the same arrangement, in the Allen steam carriage.

Adjourned till to-morrow, 10 A. M.

THURSDAY, 10th November, 1853. Present, the Commissioners and Mr. Norris.

In answer to the twenty-eighth interrogatory, he saith :

*Twenty-eighth.* I have examined the model of the eight-wheel double truck railroad car, marked "G. Bryant," and identified it with my signature. It consists of a long bearing platform, which is made of solid timbers, fastened by two solid cross pieces at the ends, which, while they unite these long timbers, at the same time constitute the bolster pieces. These bolster pieces are penetrated by king bolts, which pass through these and through the middle of the ends of the centre timber; the under part of which bolster is rounded out, and it is also armed with a transom plate and side bearings, which correspond to similar transom plates, and to the side bearings on the trucks underneath. There are two trucks, one at each end of the bearing platform, swivelling under it upon the king bolts; each truck has four wheels, and a solid rigid rectangular wheel frame, covered by a solid platform, and said wheel frames have side frames and double cross bolsters. The axletrees upon which the wheels revolve are metal, and bedded in the cross timbers at each end of the wheel frame. The bearing points of the wheels on either side of the truck are about the same distance from each other as the width of the track; the diameter of the wheels is smaller than those in general use at the present time. The trucks are coupled sufficiently apart from each other to allow each to swivel



entirely around without interfering one with the other. In regard to the mode of operation, it is the same in principle as the present eight-wheel car; the bearing points of the wheels being equidistant with the gauge of the track, and the two trucks placed at or near the ends of the bearing platform adapts this car to an equal distribution of the weight to be carried upon the rails; while the swivelling of the truck adapts it to pass smoothly and safely over the straight parts, curves and other irregularities of the road. And the peculiar shape of the bolster adapts it to conform to great and sudden changes of grade; the side bearings to prevent the body from swaying or tipping one way or the other.

It is adapted to pass all the inequalities and curves, as well as the straight track of the roads.

It is operated and constructed upon the same mechanical principles with the cars used by the Eastern Railroad and with those now in general use on the railroads of the United States.

In answer to the twenty-ninth interrogatory, he saith:

*Twenty-ninth.* Winans, amongst other things, claims as his invention two trucks supporting the body by means of upper and lower bolsters, and connecting the body of the car to the truck by means of a king bolt; these are to be found embodied in the Quincy car. The said Quincy car does not contain the peculiar mode of uniting the axles of the wheels by a spring bolted on to the boxes; and owing to the small size of the wheels, the flanges are not brought as near as possible, without coming in contract; but all that is material and essential in the arrangement of the eight wheels of the car and the connection thereof with the body, is there reduced to practice, in a manner which attains all the advantages while it avoids the defects of the arrangement as shown in Winans's specification.

In answer to the thirtieth interrogatory, he saith:

*Thirtieth.* There is nothing to prevent a builder of ordinary skill and knowledge from constructing a car, said builder having knowledge of the said Quincy car, in 1829 or 1830, having all the essential advantages of the eight-wheel car now in use. The constructor would merely have to change the proportions, and substitute wheels turning with axles, which were well known equivalents for wheels turning on axletrees; such change could be made without the exercise of any invention. There have been various improvements applied to modern cars in addition to what is in the Quincy car; but the arrangement of the wheels, and the construction and connection of the trucks with the body of the cars, still remains the same in its essential character.

In answer to the thirty-first interrogatory, he saith:

*Thirty-first.* I have seen and examined the Treatise of Wood, published in 1825, the work of Tredgold, and that of Strickland, published in 1826. The mode of drawing railroad cars, by a coupling from the middle of the ends of the bodies, was well known and used publicly, prior to 1830, and is shown and described in said printed works.

In answer to the thirty-second interrogatory, he saith:

*Thirty-second.* I have examined the last mentioned works; the bearing points appear to be about equal to the gauge or width of the track—the same as is now used by the best constructed cars.

In answer to the thirty-third interrogatory, he saith:

*Thirty-third.* Springs and pedestals, as now used in the eight-wheel

double truck cars, were applied to the four wheel cars, described and shown in the American edition of Wood's Treatise, in 1832, and in Allen's model.

In answer to the thirty-fourth interrogatory, he saith :

*Thirty-fourth.* The mode of causing the wheels of railroad cars to revolve with the axles, was a well known equivalent prior to the year 1830, for the mode of causing them to revolve *on* the axletrees. These equivalents are described in Wood, (English edition), Tredgold and Strickland.

In answer to the thirty-fifth interrogatory, he saith :

*Thirty-fifth.* It does not, in my opinion, involve any change in the mechanical principles or mode of operation in said Quincy car, to substitute for the axletrees, axles revolving with the wheels; it involves a mere alteration of proportion, or a substitution of well known equivalents for each other. It would not require any invention to make these changes. The distance between the flanges of itself is not material, and may be varied by increasing or diminishing the diameter of the wheels without changing the mechanical principles or operation of the car. The cars are generally drawn by the body, which is connected with the truck, the power being applied through the king bolt. There is no change in the mechanical principle or mode of operation, whether drawn by the body or by the truck. There is no change in the mechanical principle or mode of operation, by increasing the length of the body of the platform, or to place a box upon the top of the said platform so as to become a passenger car, or to cause it to run at a greater or less rate of speed. It would not, in my opinion, require invention to make any and all of these changes.

In answer to the thirty-sixth interrogatory, he saith :

*Thirty-sixth.* The distance between the flanges, in the construction and operation of the double truck eight-wheel car, is not of itself material, as I have before stated. It may be varied by increasing or diminishing the diameter of the wheels, without in any way changing the mechanical principles or mode of operation of the car containing them.

In answer to the thirty-seventh interrogatory, he saith :

*Thirty-seventh.* The distance between the bearing points of the wheels upon the rails is *material*, in each truck on the rails, because it is through the bearing points that the rails direct or guide the car in its motion over the road.

In answer to the thirty-eighth interrogatory, he saith :

*Thirty-eighth.* Maintaining the axles of the wheels in each truck at a fixed and uniform distance from each other is material and essential in the construction and operation of the eight-wheel car. It is necessary to hold the axles, to keep the wheels square and steady, and the truck upon the track.

In answer to the thirty-ninth interrogatory, he saith :

*Thirty-ninth.* I know of no other facts or circumstances pertinent to this issue beneficial to the Defendant.

In answer to the fortieth interrogatory, he saith :

*Fortieth.* I do not think his theory correct, nor would he obtain the desired effect, as stated in his specification. Cars constructed upon the plan proposed in Winans's specification would be unsafe, and unfit for use; the wheels, being connected together by means of a spring, and

those springs connected by a bolster, running from centre to centre, would be insecure, owing to the motion which would be given to the springs, in passing curves and inequalities of the road, which would cause the axles to be thrown out of parallelism, with a tendency of the wheel to mount the rail. I give these facts from my observations in the construction of trucks for locomotives.

SEPTIMUS NORRIS.

CHAS. HEAZLETT, }  
ROBERT P. KANE, } *Comrs.*

In answer to first cross-interrogatory, he saith :

*X First.* I have been engaged for the last fourteen years in the arrangement and construction of machinery, and have had charge of the construction of some four hundred engines during that time.

In answer to the second cross-interrogatory, he saith :

*X Second.* I have been particularly conversant with the construction of the running apparatus of railroad cars or carriages. I have paid considerable attention thereto, practically and theoretically, in the capacity of Director of the Norris Locomotive Works, for the last fourteen years, and furnishing drawings and constructing.

In answer to the third cross-interrogatory, he saith :

*X Third.* I have been examined as an expert, in courts of justice, in patent causes, probably four times—I cannot give the exact number—on subjects relating to locomotives and other railroad machinery.

In answer to the fourth cross-interrogatory, he saith :

*X Fourth.* I am accustomed, and am constantly examining and comparing machinery, with a view to forming and expressing, or acting upon an opinion as to the substantial identity between two or more machines or combinations of apparatus. I have been in such practice constantly for the last fourteen years, and my examination and comparison related to all kinds of railroad machinery, and machinery in general. I am familiar with all kinds of machinery, having made it my particular study.

In answer to the fifth cross-interrogatory, he saith :

*X Fifth.* I am not a superintendent, or officer, or employe of any railroad. I was connected as civil engineer in the survey of several roads. It was not, nor has it been, any part of my duty or employment, to attend to the construction and arrangement of the running gear of railroad cars or carriages, other than as Director of Norris Locomotive Works.

In answer to the seventh cross interrogatory, he saith :

*X Sixth.* I am theoretically and practically acquainted with railroad engineering, and fully understand the principles involved in the construction and operation of railroad cars of various kinds, and the properties essential to their proper operation, under the present condition of railroad construction and engineering, and have such a knowledge of the subject as enables me to compare the different construction of cars, and to judge therefrom whether they are practically adapted to answer the purposes required of railroad cars, under the condition of high rates of speed, steadiness of movement, and the curvatures and irregularities of the road, commonly found in the working of railroads in this country.



In answer to the seventh cross-interrogatory, he saith :

*X Seventh.* It is my opinion, as a practical engineer, that it is important and essential to the proper operation of an eight-wheel car, that it should be able to move round curves in the road, with the least practicable friction between the flanges of the wheels and the rails.

In answer to the eighth cross-interrogatory, he saith :

*X Eighth.* The question, as put, is not mechanically proper. Resistance is offered by the rails, because the rails are stationary. There is no distinction as to the importance of avoiding friction between the flanges and the rails. The active force is in the wheels, and the resistance is in the rails. The friction between the flanges of the wheels and the rails, is proportionate to the amount of force or pressure with which the flanges are brought against the rails.

In answer to the ninth cross-interrogatory, he saith :

*X Ninth.* The wheels of a four-wheel car, or of a truck of an eight-wheel car, will not run upon a curve with less friction between the flanges and the rails, the nearer the axles of the wheels are to each other. It would not answer to put the wheels as close as they can be, without the flanges touching, as stated in Winans's specification. Such closeness would allow the wheels to have too much lateral motion between the rails ; they would not be steady ; would get too oblique to the rails ; would cause or produce lateral friction of the flanges, which the specification professes to obviate. The means and method described by Winans will not produce the effects or benefits at which he aims.

In answer to the tenth cross-interrogatory, he saith :

*X Tenth.* The wheels of the trucks of an eight-wheel car will not, independently from other considerations, run upon the curve and over the irregularities of the road, and yield to the guidance of the rails with the least friction, when the trucks have the greatest freedom of motion. Trucks will run with the greatest ease, and bind less on the rails, when the bearing points of the wheel are distant about the same as the gauge of the track.

In answer to the eleventh cross interrogatory, he saith :

*X Eleventh.* I am acquainted, by reading, with the state of railroad engineering at and before the date of the patent of Winans, and particularly prior to 1830, and can compare the present advanced state of railroad engineering with what then existed. In order to obtain a thorough knowledge of my profession it was necessary to become thoroughly conversant with all mechanical works, particularly those relating to rail road machinery ; and by this means, and by study, I became perfectly familiar with such machinery, and machinery in general.

In answer to the twelfth cross-interrogatory, he saith :

*X Twelfth.* In my opinion it is important and essential to the running of cars at high speeds, such as have been practised since the time of said Winans's invention, that they should be made in such a manner as to ensure greater steadiness of motion than was attained by the four-wheel cars. It is not my opinion that making the car body of great length, as compared with the modes before practised, and supporting the same at or near its ends, are essential to the attainment of greater steadiness of motion at high velocities, than could be obtained by the four-wheel cars, as formerly constructed. It does not answer to make the car body of a great length, say 60 feet, as it allows the body to spring and tremble too much, and be too unsteady. Thirty-five to



forty feet is a better length, and should not be supported at or near the ends, as this would let the trucks strike and clash together.

In answer to the thirteenth cross-interrogatory, he saith :

*X Thirteenth.* It is, in my opinion, essential to the proper construction of an eight-wheel car, that it should have the capacity to work with other cars in a long train, and in any part of the train in which it may be placed.

In answer to the fourteenth cross-interrogatory, he saith :

*X Fourteenth.* It is important and essential to the proper working of the first car in a train, that while it is subjected to the whole draft of the train, its trucks shall have the same freedom of motion that any other trucks in the train have.

In answer to the fifteenth cross-interrogatory, he saith :

*X Fifteenth.* It is essential, in order to give freedom of motion to the trucks of all the cars in the train, that the draft should be applied by and through the intervention of the king bolt connecting the body and truck together. The draft should not be applied to the trucks, but must act through them before the car can be moved.

In answer to the sixteenth cross interrogatory, he saith :

*Sixteenth X.* The model B does truly represent the car described in the Plaintiff's patent, in the extent of bearing surface between the bolsters, as near as may be ; it bears on the centre. The drawing represents a *freight car*, not described in the specification, and shows extended side bearings, while none are described in the specification. The patent says the body is to rest on the centre of the bolster ; this is inconsistent with extended side bearings, as shown in the drawing. Model B and the drawing differ in the respects I have named.

In answer to the seventeenth cross-interrogatory, he saith :

*Seventeenth X.* The model B does not show the mode of drawing the car ; and none is described or claimed in the specification. The drawing of the freight car shows a coupling bolt, with a ring in it, but nothing is said about it in the *references* on the drawing.

In answer to the eighteenth cross-interrogatory, he saith :

*Eighteenth X.* There is no particular form of spring, or mode of constructing the framing of the truck, described by the Complainant, in his specification, as an essential part of his invention.

In answer to the nineteenth cross-interrogatory, he saith :

*Nineteenth X.* I consider the use of springs essential to the proper construction of an eight-wheel car.

In answer to the twentieth cross-interrogatory, he saith :

*Twentieth X.* Chapman's specification does describe and the drawings represent a railroad car or carriage, like model K, which is the same in construction, principles and action, as the cars now in use. The description is perfectly plain and intelligible.

I refer to Repertory of Arts, vol. 24, page 130, where the following language is used : "We also, as the carriage containing the motive power, will, thus loaded, be too heavy, in various cases, for the strength of the existing iron or wooden rails, if resting on four wheels only, so arrange it for such ways, or other confined ways, where the ledges of either of the ways or of the wheels regulate the direction of the carriage, that it may rest equably and more freely round curves or angles, either on six or eight wheels, so as to reduce its pressure on

each in the inverse proportion of its number of wheels." At page 139, same book: "Figure 8 shows a carriage of six wheels, for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves, or pass the angles of the railway; 1.1, the four pair of wheels are as usual on railways fixed to the body of the carriage; 2.2 and 3.3, the other two pair, on axles parallel to each other, to a separate frame, over which the body of the carriage should be so poised, as that two thirds of its weight should lie over the central point of the four wheels, where the pivot 4 is placed, and the remaining one third over the axis 1.1. The two-thirds weight of the carriage should rest on conical wheels, or rollers, bearing upon the curved plate C.C, so as to admit the ledges of the wheels, or those on the way, to guide them on its curves or past its angles, by forcing the transom, or frame, to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal waggon; and if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in the place of the axis 1.1, a transom such as described, laying the weight equably on both; and then, similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway."

The drawings referred to in this description, are between pages 130 and 131, same book.

The draft is applied to the end of the car by means of a chain.

In answer to the twenty-first cross-interrogatory, he saith:

*Twenty-first X.* In the drawings and description, in the Treatise by Tredgold, of a carriage with eight wheels, there is no representation and description of a draw link attached to the end of the body as is shown in the model A.

I refer to Tredgold's Treatise on Railroads, &c. 1825; the language is thus, on page 176: "From thirteen to seventeen of these wagons are drawn in a train by one steam carriage; they are connected by the short chain C. C., figure 2, plate 1." The drawing referred to follows page 184, same book.

In answer to the twenty-second cross interrogatory, he saith:

*Twenty-second X.* In said Tredgold's Treatise there is a description and drawing of a mode for enabling the truck or wheel frames of said car with eight wheels to swivel laterally, to conform to the curves of the road.

In plate 4, figure 26, (same book,) and in the description of the plates, page 179, he says—"A diagram to show how a wagon may be made with eight wheels, so that the stress of each wheel on the rails of a railroad may be equal; the body of the wagon rests on the wheel frames at A. A., and is connected to them by an axis on which the frames turn, when, from any inequality, the axis of the wheels are not on the same plane." The drawing referred to is the last drawing in the book.

In answer to the twenty-third cross-interrogatory, he saith:

*Twenty-third X.* I have described in my answer to the 27th direct interrogatory, the part or parts of Winans's invention, embraced in the model of the steam carriage. Winans's specification says—"For this purpose I construct two bearing carriages, each with four wheels, which are to sustain the body of the passenger or other car by placing

one of them at or near each end of it." Again: "Having thus connected two pairs of wheels together, I unite them in a four-wheel bearing carriage, by means of their axles and a bolster of a proper length extending across between two pairs of the wheels. This bolster must be of sufficient strength to bear a load upon its centre, of four or five tons. Upon this bolster I place another of equal strength, and connect the two together by a centre pin or bolt passing down through them, and thus allowing them to swivel or turn upon each other, in the manner of the first bolster of a common road wagon.

In answer to the twenty-fourth cross-interrogatory, he saith:

*Twenty-fourth X.* I have stated particularly, in my answer to the 29th direct interrogatory, what parts of the invention of Winans is embraced in the Quincy car. The language quoted in answer to the twenty-third cross interrogatory, in relation to the Allen car, is equally applicable to this, and to it I refer as the language of the specification in which such parts are described.

In answer to the twenty-fifth cross-interrogatory, he saith:

*Twenty-fifth X.* From my knowledge of the state of railroad engineering and science, in 1829 and 1830, a mechanic of ordinary skill, having all the knowledge possessed by the world at that time about the construction of cars, would have known what the requirements and characteristics of a railroad passenger car must have been, to enable it to move safely and smoothly over the curves and irregularities of a railroad, as then or now constructed, at a rate of thirty miles per hour, and to perform the duties required of the ordinary eight-wheel cars now in use. He could have derived his knowledge from Chapman's specification of 1814; from the description in Tredgold's Treatise in 1825; from the Quincy car of 1829, and from the Allen car or steam carriage of 1830. In Allen's steam carriage, by removing the boiler, a platform could be arranged with convenient seats for passengers. I have answered this interrogatory as fully and particularly as I am able to do.

In answer to the twenty-sixth cross-interrogatory, he saith:

*Twenty-sixth X.* I consider the arrangement of railroad-car wheels fixed firmly to their axles, and rotating with them, to be the same in principle and well known equivalents, with those rotating loosely upon fixed axles.

In answer to the twenty-seventh cross-interrogatory, he saith:

*Twenty-seventh X.* From the model of the Quincy car, the draft seems to have been applied to the end of the truck by means of an eyebolt. I don't know of its application except as shown in the model.

In answer to the twenty-eighth cross-interrogatory, he saith:

*Twenty-eighth X.* I do not consider it a matter of indifference whether the draft be applied to the truck or the body of the car. I consider it preferable to draw from the middle of the ends of the body of the car.

In answer to the twenty-ninth cross-interrogatory, he saith:

*Twenty-ninth X.* The cars described in the works of Wood, Tredgold, and Strickland, and referred to in the thirty-first interrogatory as having the draft applied to the middle of the ends of the body were four-wheel cars; the wheels were attached to the said body. I think that so far as relates to the traction by the middle of the end of the body, it relates as well to the eight-wheel cars they describe, as to the



four-wheel cars; their only change between the cars is in the length of the body, and the running gear, not in mode of traction; and I do not find in Winans's specification, any description or claim of any mode of drawing his car.

In answer to the thirtieth cross-interrogatory, he saith:

*Thirtieth X.* All that I have seen relating to eight-wheel cars have been models and drawings, and in the model of the Quincy car the draft is applied to the truck and not to the body. The drawings of the eight-wheel cars do not represent any mode of attachment. I can only speak of the mode of applying the draft, from the models as exhibited to me.

In answer to the thirty-first cross-interrogatory, he saith:

*Thirty-first X.* The drawings and description of the "Chapman Engine," referred to in the 14th direct interrogatory, or the drawings and description in Tredgold's Treatise, referred to in the 20th direct interrogatory, or the drawings and model of the Allen locomotive, referred to in the 27th direct interrogatory, or the model of the Quincy car, or either or all of them, would *not* teach a mechanic of ordinary skill and knowledge in the construction of cars, in the year 1830, that placing the wheels of the trucks very near together would reduce the friction between the flanges of the wheels and the rails over curves.

In answer to the thirty-second cross-interrogatory, he says:

*Thirty-second X.* The same drawings and descriptions would not have taught such a mechanic in the year 1830, that great stability of motion, when running at high velocities, could be attained by constructing the car body of great length, and supporting it at or near each end, upon two trucks thus constructed.

In answer to the thirty-third [?] interrogatory, he saith:

*Thirty-third X.* The drawings and descriptions would not have taught such a mechanic, in the year 1830, that in order to move over the curves and irregularities of a railroad, at a high velocity, with safety and stability of motion, and with the least practicable friction on the rails, that the trucks should have the greatest possible freedom to conform to the surface of the rails, and should not be constrained by the draft.

In answer to the thirty-fourth cross-interrogatory, he saith:

*Thirty-fourth X.* In the drawings and descriptions aforesaid there is no description or allusion to any arrangement or modification in the construction of railroad cars, by which they might be run at high velocities, such as has been practised since 1830 [?]. By the description of the Chapman, Tredgold, Allen and Quincy cars, they might be run at the speed of thirty miles per hour.

In answer to the thirty-fifth cross-interrogatory, he saith:

*Thirty-fifth X.* It is the purpose, shown and expressed in the drawings and descriptions before referred to, of the employment of eight wheels in a car or carriage, solely for the purpose of carrying great weights, and dividing the weight equally on eight wheels, in order not to place a greater load on each wheel than they and the rails could well bear.

In answer to the thirty-sixth cross-interrogatory, he saith:

*Thirty-sixth X.* Such eight-wheel cars were not, so far as my knowledge extends, employed previous to the year 1830, except to carry weights that could not be subdivided and carried upon four-wheel cars.

In answer to the thirty-seventh cross-interrogatory, he saith:



*Thirty-seventh X.* I have not been nor am I now employed, by any person or persons, corporation or corporations, to assist in the preparation of the defence of this case, or to collect evidence to impeach the validity of the Patent of Ross Winans, in controversy in this suit; nor am I in any way connected with this case, except as a witness, summoned to testify, under the present commission, nor am I in any way interested in the result of this controversy.

In answer to the thirty-eighth cross-interrogatory, he saith :

*Thirty-eighth X.* I am not connected in any way with any railroad company.

In answer to the thirty-ninth cross-interrogatory, he saith :

*Thirty-ninth X.* I have formed an opinion that the Letters Patent of Ross Winans, now in controversy in this case, are invalid for want of novelty or originality. I did not form any opinion upon the subject until after I had examined the Letters Patent of said Winans, and compared the alleged invention therein described, with the previously existing cars or carriages or descriptions inquired about in the direct interrogatories. I did not converse with any person upon the subject of the novelty or originality of the said alleged invention of Ross Winans before I made the examination of the Letters Patent, and the comparison inquired of.

In answer to the fortieth cross-interrogatory, he saith :

*Fortieth X.* I have not so stated, nor am I a railroad superintendent, or a member of any association of railroad superintendents, nor have I, since the commencement of this suit, or at any time, taken any action in reference to defending the same, or aiding in the defence thereof, or for the purpose of collecting evidence to impeach the validity of said Winans's patent. I have neither instructed, nor aided, nor consulted with the Counsel or Solicitor for the Defendants, in the preparation of the defence.

In answer to the forty-first [?] interrogatory, he saith :

*Forty-first X.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, until they were propounded to me by the Commissioners.

SEPTIMUS NORRIS.

CHAS. HEAZLITT.

The said Septimus Norris, in answer to interrogatories, marked "Further Interrogatories," saith, in answer to interrogatory

*First.* I do not know any fact or circumstance tending to show whether or not the eight-wheel car, now in common use on railroads, was used with the knowledge of said Winans, and without objection or claim thereto on his part.

In answer to the second interrogatory, he saith :

*Second.* In my opinion it would not introduce any new mechanical principle, or any new mode of operation into the Chapman, 'Tredgold, Allen, or Quincy car or carriage, if (instead of the bodies or platforms now shown or described) you should substitute longer bodies, retaining the same trucks or bearing carriages, and placing them under the body thus substituted, at the same distance from the respective ends thereof.

In answer to the third interrogatory, he saith:

*Third.* It would not, in my opinion, require invention to make that substitution.

In answer to the fourth interrogatory, he saith :

*Fourth.* There is nothing in the description or drawings, in Tredgold's car or carriage, which renders it essential that all the wheels should be placed at equal distances apart; and if two trucks are placed remotely from each other, under one body, by the substitution of a longer body, there is nothing whatever in such remoteness of the trucks from each other, inconsistent or incompatible with said description or drawings, or with the objects and purposes set forth by said Tredgold in his said treatise.

In answer to the fifth interrogatory, he saith :

*Fifth.* I make to this interrogatory the same answer as to the fourth interrogatory.

In answer to the sixth interrogatory, he saith :

*Sixth.* I make the same answer as is made to the fourth interrogatory.

In answer to the seventh interrogatory, he saith :

*Seventh.* There is nothing in the Quincy car, judging by the model before me, and what I know of its structure and uses, and mode of operation, which renders it essential that all the wheels thereof should be equidistant from each other, under one body. And the change of a longer instead of a shorter body (so that the same trucks should be coupled by the body, remotely from each other, while the body should be supported at or near the two ends) would not be in anywise inconsistent or incompatible with the objects and purposes for which the Quincy car is designed and used.

In answer to the eighth interrogatory, he saith :

*Eighth.* The mechanical theory of Winans's specification, is to connect the two pairs of wheels, in each bearing carriage, as close as possible, without their flanges touching, to act like a single wheel, and to have the axles coincide, as nearly as possible, with the radius of the curve upon which the truck is traversing, these wheels being connected by big springs, bolted to the tops of the boxes, and a waggon bolster extending across between the springs, the centre of the bolster to bear the weight of the load; two of these are connected, one at or near, or beyond each end of the car. The mechanical theory on which the running gear of the eight-wheel cars, now in common use, is to have a rigid wheel frame truck, with the axles held parallel to each other, the distance apart of the axles being about the same as the width of the track, forming a square with the bearing points of the wheels, from one to the other, as near as may be, so that the active and reactive force shall be balanced about the king bolt centre; the action of the spring is confined vertically to the track, and the stiff frame holds the wheel square on the track; two of these trucks are connected to the car body by male and female transoms, plate centres and king bolts; they are placed about from five to seven feet from each end of the body,—sufficiently far to sustain the body with the least strain, and protect the truck from collision in trains. This mechanical structure and theory, and Winans's mechanism and theory, are essentially different in details.

In answer to the ninth interrogatory, he saith :

*Ninth.* It is not necessary, according to the specification of said Winans, in order to accomplish the purposes claimed and stated by him, to use or employ *very long* bodies.

In answer to the tenth interrogatory, he saith :

*Tenth.* I have answered the 33d cross-interrogatory, that it is not essential to the proper and safe construction of eight-wheel cars, for rapid travelling, that the trucks should have the greatest possible freedom of swivelling, to conform to the surface of the rails.

The trucks should be controlled sufficiently to keep them steady between the rails, so as to follow the course of the track. This should be done by having the bearing points of the wheels as far apart as the breadth of the track, or not less than that distance; if they are brought close together, the trucks would have too much lateral motion, and become too unsteady for safety; they should be controlled in the line of motion, and not have the greatest possible freedom to conform to the surface of the rails in the sense of Winans's specification.

SEPTIMUS NORRIS.

CHAS. HEAZLITT,  
ROBERT P. KANE.

In answer to the further cross-interrogatories—to the first of said interrogatories, he saith :

*First.* The theory of the Plaintiff, referred to in the 8th additional, I conceive to be as I have therein stated it, fully and at large.

In answer to the second additional cross-interrogatory, he saith :

*Second.* The average rate of speed upon railways, prior to 1830, was about fifteen miles per hour. Railways were principally used prior to that date for conveying passengers and freight.

In answer to the third additional cross-interrogatory, he saith :

*Third.* They were constructed with T rail—some with flat rail; they were constructed of such materials, and *in such way*, that *distribution* rather than *concentration* of the weight of the cars and of the locomotive was required.

In answer to the fourth additional cross-interrogatory, he saith :

*Fourth.* I do not know whether there was more than one railway in England prior to 1830, upon which passengers were habitually carried.

In answer to the fifth additional cross-interrogatory, he saith :

*Fifth.* The use to which railways, prior to that time, were put, in the course of their regular business, was the transmission of trains of merchandize, by horse power and by steam. I cannot say that such was the habitual use, but both horse power and steam were used.

In answer to the sixth additional cross-interrogatory, he saith :

*Sixth.* The average speed was more than six miles per hour, prior to that date. It was about ten miles in this country; and in England greater speed was made. I cannot recollect more definitely.

In answer to the seventh additional cross-interrogatory :

*Seventh.* I have designed railroad cars—passenger cars. I can't give the date of each car so designed by me without referring to my draw-

ings; they were not placed upon any road to my knowledge; I designed them, but I have no knowledge of their being built.

SEPTIMUS NORRIS.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Com's.*

### DEPOSITION OF RICHARD FRENCH.

FRIDAY, November 11, 1853. Richard French, being duly sworn, on behalf of the Defendants, saith, in answer to interrogatory

1. First: my name is Richard French; my age is fifty-three; my place of business is Broad street, below Wood, in the city of Philadelphia; my residence is at No. 276 North Eleventh Street, in that city my profession or occupation is that of a machinist or engineer.

2. To the second interrogatory, he saith:

I have served my time with my father, as a millwright, from the age of fourteen to twenty-one; afterwards worked as a machinist, and was for thirteen years superintendent of motive power on the Norristown Railroad, which last position I resigned about eighteen months ago.

3. To the third interrogatory, he saith:

I am familiar with the mechanical principles of the construction and operation of double truck, eight-wheel railroad cars, used by the Eastern Railroad Company, or those now in general use on the railroads of the United States.

4. To the fourth interrogatory, he saith:

I have examined the specification referred to.

5. To the fifth interrogatory, he saith:

I have examined the model B, and have identified the same with my signature. The model B is a true representation of the car described and recommended in the specification, as far as the specification goes. I mean that the specification does not describe the manner in which the bolster is to be fastened to the top of the spring. I see no differences between the model and the specification.

6. To the sixth interrogatory, he saith:

The parts and the arrangement thereof, in my opinion, essential and elemental, are a strong rigid frame, pedestals to retain the axles in their parallelism, springs of sufficient elasticity to cause the car to ride with ease and comfort, with a centre bearing equidistant from the wheels on which the body of the car rests, secured by a strong transverse bolt.

7. To the seventh interrogatory, he saith:

The cars referred to have improvements or inventions applied to them not described in said specification. There are the equalizing beam, the swinging bolster, the transom plates, male and female, the one fitting into the other. Indeed, the general construction of the trucks of the cars referred to is different.

8. To the eighth interrogatory, he saith:

The bodies of the cars referred to, are so constructed as to be able to be removed from the trucks whenever desired, by taking out the king-bolt. The bolster of the trucks is usually placed from five to six feet from the end of the framing of the body.

9. To the ninth interrogatory, he saith:



The cars referred to have side bearings, and the object of such bearings is to limit the rocking of the cars.

10th. To the tenth interrogatory, he saith :

Check chains are in use, and are for the purpose of preventing the truck, when it runs off the track, from turning round.

11. To the eleventh interrogatory, he saith :

Increasing or diminishing the length of the body of the said eight-wheel car, the trucks being placed at the same distance from the ends of the body, does not introduce any new or different mechanical principles into the organization of the car, nor does such change require any exercise of invention.

12. To the twelfth interrogatory, he saith :

Connecting the wheels of a passenger car by long springs, as described in said specification, may be practicable, but is not safe.

13. To the thirteenth interrogatory, he saith :

I have examined the drawing of the railroad freight car referred to. That drawing shows a car entirely different from that particularly described and recommended in said specification. The drawing differs from the specification in having a rigid frame of wood, to which a spring for each journal is attached ; the wheels bearing upon the middle portion of the spring, instead of upon the end. The springs too in the drawing are not reversed, as those described in the specification ; the springs in the specification having the shorter leaves uppermost ; those in the drawing having the longer leaves uppermost, and the ends entering into a cast iron pocket. In the specification, the ends of the spring are bolted on to the axle-boxes ; in the drawing the axle-boxes are bolted on to the lower sides of the springs. The wheels too, in the drawing, are farther apart than those described in the specification, leaving room for a brake ; whilst the specification directs that the wheels be very near each other, considering the contiguity of the fore and hind wheels of each bearing carriage, as a most important feature of the invention.

14. To the fourteenth interrogatory, he saith :

I have seen and examined the work referred to, and more particularly the part which contains the specifications and drawings of the patent of William and E. W. Chapman.

To the fifteenth interrogatory, he saith :

15. I have examined the model marked K, and have identified it with my signature. Said model truly and correctly represents the railroad car or carriage of William and E. W. Chapman, described and shown in said book and drawings.

16. To the sixteenth interrogatory, he saith :

A car builder, of ordinary skill and knowledge of his profession, would undoubtedly be able, by aid of said specification and drawings, and without the necessity of exercising his own invention, to construct eight-wheel railroad cars, substantially the same as those now used by the Eastern Railroad and other railroads generally, so far as respects the manner of arranging and connecting the eight wheels, and the connection of the trucks with the body of the cars.

17. To the seventeenth interrogatory, he saith :

Chapman's car, as shown in said book and drawings, has side bearings and centre pivot, and rigid rectangular wheel frame.

18. To the eighteenth interrogatory, he saith :

The distance between the bearing points of the wheels of said car, is about equal to the width of the track. I have measured the same.

19. To the nineteenth interrogatory, he saith :

The model now before me, and marked K, and identified by my signature, may be made to represent both the six and eight-wheel carriage.

20. To the twentieth interrogatory, he saith :

I have examined the work of Thomas Tredgold, referred to, and the drawings therein, and I find both the drawing and description of a double truck eight-wheel railroad car.

21. To the twenty-first interrogatory, he saith :

The component parts of the Tredgold car, are a rigid truck frame, a centre of the truck, on which the body of the car rests, and which serves as an axis, on which the truck turns, conforming itself to the curves of the road, whilst the weight of the car is equally distributed upon the bearing point of each wheel. The Tredgold car is calculated to operate in the same manner as our present eight-wheel car, in adapting to the curves and inequalities of the road.

To the twenty-second interrogatory, he saith :

I have examined the model marked A. It is a correct representation of said eight-wheel car of said Tredgold. I think it does not differ in any respect therefrom.

I have examined model C. I do not think it a correct representation of said eight-wheel car of said Tredgold, or of any car described by him. It has not the centre pin or swivel, to adapt itself to the curvatures of the road, or to equalize the bearing on the several wheels.

To the twenty-third interrogatory, he saith :

*Twenty-third.* I have compared the eight-wheel car of said Tredgold, with the eight-wheel cars used by the Eastern Railroad, and in general use in this country, so far as regards the running gear. In their mechanical principles and mode of operation they are substantially identical.

To the twenty-fourth interrogatory, he saith :

24. I have said, in answer to an interrogatory, that the Tredgold car is calculated to conform to all the irregularities of railroads. It is calculated to answer the purposes and objects set forth in said Winans's specification, as designed to be accomplished by him.

To the twenty-fifth interrogatory, he saith :

25. I have seen the Letters Patent of the United States, granted to Jonas P. Fairlamb, dated January 19, 1833, and the drawings and specifications thereof.

The principle of said Winans's invention, as described and shown in his patent, is described and shown in said Fairlamb's patent and drawing.

In both Winans's and Fairlamb's patent, the trucks both swivel on a king bolt. They both have strong transverse bolsters, on which the body of the car or engine rests, equalizing the bearing between each individual wheel.

To the twenty-sixth interrogatory, he saith :

26. A mechanic of ordinary skill in car building, having knowledge of said Fairlamb's patent and *drawings*, would be enabled, without exercising invention, to construct eight-wheel double-truck cars, sub-

stantially like those used by said Eastern Railroad, or like those now in common use on the roads of the United States; and such cars would embody the essential principles of the eight-wheel railroad car in common use, and would attain the beneficial results pretended to be obtained by said Winans in his said patent.

To the twenty-seventh interrogatory, he saith :

27. I have examined the model of the Allen steam carriage, marked "Horatio Allen," now shown to me by the Commissioners, and have identified the same with my signature. The drawings of the said carriage are not shown to me.

The principles of the construction and arrangement of the running gear, are a rigid truck-frame, having four wheels, supported in pedestals to preserve the parallelism of the axes, the points at which the wheels bear being equidistant with the gauge of the track; and such construction and arrangement are calculated to attain the practical benefits of the eight-wheel railroad cars now in general use, and are substantially the same as these. The Allen steam carriage, as shown in the model, contains the construction and organization necessary to produce the beneficial results stated and claimed to be accomplished in the said Winans's specification of October 1, 1834.

The trucks swivelling on a king-bolt, passing through a strong transverse bolster, on which the body of the car or engine rests, equalizing the weight upon the wheels or four points of bearing: these, as found in Winans's invention, are embodied in the Allen steam carriage.

To the twenty-eighth interrogatory, he saith :

28. I have examined the model of the eight-wheel double truck railroad car now before me, marked "G. Bryant," and have identified the same with my signature. This car is supported on two trucks, composed of rigid rectangular wheel frames, the wheels being placed at about the gauge of the track from centre of axis to centre of axis. The body of the car is connected with the trucks by strong king-bolts, as in the eight-wheel cars now in general use, on which king-bolts the trucks swivel. This car then is adapted to pass all the inequalities and curves as well as the straight track of the roads. It is constructed and operated upon the same mechanical principles with the cars used by the Eastern Railroad, or with those now in general use on the railroads of the United States.

To the twenty-ninth interrogatory, he saith :

29. The invention described by the said Ross Winans, in his letters patent, in all that is essential or material, is to be found embodied in the Quincy car. The Quincy car, however, has not the connection of the wheels by springs, nor are the wheels in it brought as near as possible together as they can be without contact.

To the thirtieth interrogatory, he says :

30. A mechanic of ordinary skill and knowledge in building railroad cars, having knowledge of the aforesaid Quincy car, in 1829 or 1830, would have been able, at that time, without the exercise of invention of his own, to construct double truck eight-wheel railroad cars substantially like those now in general use, so far as regards the arrangement of the wheels and the connection of the trucks with the body of the cars.

To the thirty-first interrogatory, he says :



31. I have seen and examined the treatise of Wood, published in 1825, the work of Tredgold, and that of Strickland, published in 1836. The mode of drawing railroad cars by a coupling from the middle of the ends of the bodies, was well known and publicly used previously to the year 1830, and is shown and described in these works.

To the thirty-second interrogatory, he says :

32. I have examined the last mentioned printed works. The distance of the bearing points of the wheels are about equal to the gauge or width of the track, on the cars shown and described therein. It is a general rule, at this time, to place the bearing points of the wheel about the same distance apart as the gauge of the track.

To the thirty-third interrogatory, he says :

33. Springs and pedestals, as now used on the eight-wheel double truck cars, were applied to the four wheel cars, described and shown in the American edition of Wood's Treatise in 1832, and in said Allen's model.

To the thirty-fourth interrogatory, he saith :

34. Before 1830, the mode of causing the wheels of railroad cars to revolve with the axles, was a well known equivalent for the mode of causing them to revolve *on* the axles. These equivalents were described and shown in the works I have referred to.

To the thirty-fifth interrogatory, he says :

35. It does not, in my opinion, involve any change in the mechanical principles or modes of operation in said Quincy car, to substitute for the axletrees, axles revolving with the wheels, or, larger wheels instead of those used, so as to cause the flanges of the wheels on each truck to approach very near each other; or, to draw the said car by the body, instead of drawing it by the truck; or, to increase the length of the body of the platform; or to place a box upon the top of the said platform, so as to become a passenger car; or, to cause it to run at any greater or less rate of speed. It would not, in my opinion, require invention to make any or all of these changes. Any good mechanic could make them from the model or drawings.

To the thirty-sixth interrogatory, he saith :

36. In the construction and operation of the double truck eight-wheel car, the distance of the flanges from each other is not *of itself* material. The distance may be varied by substituting larger for smaller wheels without in any way changing the mechanical principles or mode of operation of the car containing them.

To the thirty-seventh interrogatory, he saith :

37. The distance of the bearing points upon the rails, of the wheels in each truck, is material and essential to the operation of the cars. It is by their action that the car is guided in its course over the road. If too close together, they are more likely to run off, upon any obstacle being thrown in their way; and by pressing harder on the outer rails they cause greater friction upon the rail and upon the wheel.

To the thirty-eighth interrogatory, he saith :

38. Maintaining the axles of the wheels in each truck, at a fixed and uniform distance from each other, is essential and material in the construction and operation of the eight-wheel car. It is necessary to hold the axles square and steady to keep the car upon the track.

To the thirty-ninth interrogatory, he saith :



39. I do not know any other fact or circumstance which is, in my opinion, pertinent to this issue, and beneficial to the Defendant.

To the fortieth interrogatory, he saith :

40. The theory of said Winans for constructing and arranging an eight-wheel car, as set forth in his patent, I consider incorrect; and a car constructed according to said theory and specification would not be practicable for the purposes he describes; a car so constructed would not remain upon the track, and would be unsafe as a passenger car. If any of the connections broke, the car of necessity would fall upon the track.

My opinion is formed from reading the specifications, and my mechanical knowledge.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Comms, &c.*

To the first cross-interrogatory, he saith :

1 X. I have been for the last thirty-five years engaged in the construction, arrangement and examination of machinery, and for half that time have been engaged, directly or indirectly, in the construction of railroad cars and engines.

To the second cross-interrogatory, he saith :

2 X. I have been particularly conversant with the construction of the running apparatus of railroad cars and carriages. I have paid particular attention to it, and have made it a particular study. I was superintendent of motive power, on the Norristown railroad, for some thirteen years; and during that time, by observation and by constant reading, became familiar with the subject inquired of.

To the third cross-interrogatory, he saith :

3 X. I have been examined as an expert in courts in patent cases, I think about three times. Once, in reference to locomotives; and the others were, I think, in reference to a mill gearing apparatus.

To the fourth cross-interrogatory, he saith :

4 X. I have been accustomed to the examination and comparison of machinery, with a view of forming and expressing and acting upon an opinion, as to the substantial identity between two or more machines or combination of apparatus. I cannot state the extent to which I have practised this examination. I have done it whenever opportunity offered. The subjects of which I have been most conversant for the last eighteen years has been connected with railroad machinery.

To the fifth cross-interrogatory, he saith :

5 X. It was my duty, while I was Superintendent of the Norristown railroad—it was a part of my duty and employment, to attend to the construction and arrangement of the running gear of railroad cars or carriages.

To the sixth cross-interrogatory, he says :

6 X. I am theoretically and practically acquainted with railroad engineering, and fully understand the principles involved in the construction and operation of railroad cars of various kinds, and the properties essential to their proper operation, under the present condition of railroad construction and engineering. I have such a knowledge of the subject, as will enable me to compare the different construction of cars, and to judge therefrom whether they are practically adapted to answer

the purposes required of railroad cars, under the condition of high rates of speed, steadiness of movement, and the curvature and irregularities of the road, commonly found in the working of railroads in this country.

To the seventh cross-interrogatory, he saith :

7 X. It is my opinion, as a practising engineer, that it is important and essential to the proper operation of an eight-wheel car, that it should be able to move round curves in the road, with the least practicable friction between the flanges of the wheels and the rails.

To the eighth cross-interrogatory, he saith :

8 X. The friction between the flanges of the wheels and the rails will be proportionate to the resistance which the wheels offer to the guidance of the rails.

To the ninth cross-interrogatory, he saith :

9 X. The wheels of a four-wheel car, or of a truck of an eight-wheel car, will not run upon a curve with less friction between the flanges and the rails, the nearer the axes of the wheels are to each other. They will jamb between the rails, by running oblique to the track.

To the tenth cross-interrogatory, he saith :

10 X. The wheels of the trucks of an eight-wheel car, independently from other considerations, will not run upon the curve, and over the irregularities of the road, and yield to the guidance of the rails, with the least friction when the trucks have the greatest freedom of motion between the rails. If the freedom of motion is on the centre, it will run with less friction.

To the eleventh cross-interrogatory, he saith :

11 X. I believe I am sufficiently acquainted, from reading, with the state of railroad engineering, at and before the date of said Winans's Patent, and particularly prior to 1830, to compare the present advanced state of railroad engineering with what then existed.

To the twelfth cross-interrogatory, he saith :

12 X. In my opinion it is important and essential to the running of cars at high speeds, such as have been practised since the time of said Winans's inventions, that they should be made in such a manner as to ensure greater steadiness of motion than was attained by the four-wheel cars. It is my opinion that making the car body of great length, as compared with the modes before practised, and supporting the same at or near its ends, are essential to the attainment of greater steadiness of motion at high velocities, than could be obtained by the four-wheel cars as formerly constructed.

In answer to the thirteenth cross-interrogatory, he saith :

13 X. It is, in my opinion, essential to the proper construction of an eight-wheel car, that it shall have the capacity to work with other cars in a long train, and in any part of the train in which it may be placed.

In answer to the fourteenth cross-interrogatory, he saith :

14 X. It is important and essential to the proper working of the first car in a train that, while it is subjected to the whole draft of the train, its trucks shall have the same freedom of motion that any other trucks in the train have.

In answer to the fifteenth cross-interrogatory, he saith :

15 X. It is essential, in order to give freedom of motion to the trucks

of all the cars in the train, that the draft should not be applied to nor act through them.

In answer to the sixteenth cross-interrogatory, he saith :

X 16. Model B truly represents the car described in the Plaintiff's patent, in the extent of bearing surface between the bolsters. This does not agree with the drawing ; the drawing shows side bearings, which are not described in the specification. The car, as shown by the drawing, is not described in the specification ; it is entirely different.

In answer to the seventeenth cross-interrogatory, he saith :

X 17. Model B does not show the mode of attaching the draft, as is represented in the drawing attached. Nothing is said, in said Plaintiff's patent, about attaching the draft, nor is any shown in the model B.

In answer to the eighteenth cross-interrogatory, he saith :

X 18. A particular form of spring, and mode of constructing the framing of the truck, is described by the Complainant, in his specification, as an essential part of his invention.

In answer to the nineteenth cross-interrogatory, he saith :

X 19. I consider the use of springs essential to the proper construction of an eight-wheel car.

In answer to the twentieth cross-interrogatory, he saith :

X 20. The description and drawings of the Chapman car, inquired of in the fourteenth direct interrogatory, represents a railroad car like model K, and is described in ordinary language. On page 139, Repertory of Arts, Manufactures and Agriculture, 2nd Series, 1814, the following language is used : " Figure 8 shows a carriage of six wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway ; 1, 1, the fore pair of wheels are, as usual on railways, fixed to the body of the carriage ; 2, 2, and 3, 3, the other two pair, are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised as that 2-3ds of its weight should be over the central point of the four wheels, where the pivot 4 is placed, and the remaining 1-3d over the axis 1, 1. The 2-3ds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates C C, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal waggon. And, if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equably on both), and then similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway."

The drawing to which I refer, is in the same book, between pages 136 and 137.

The draft there is from the body.

In answer to the twenty-first cross-interrogatory, he saith :

X 21. I do not find in the drawings and description, in the treatise by Tredgold, of a carriage with eight wheels, any representation or description of a draw-link attached to the end of the body, as is shown in model A.

Figure 1, plate 2, is described on page 176, of said treatise, and



the following language is used: "From 13 to 17 of these wagons are drawn in a train by one steam carriage; they are connected by the *short chain C C*." This refers to four-wheel carriages, and could be as well adapted to eight wheels.

In answer to the twenty-second cross-interrogatory, he saith:

X 22. There is a description or drawing in said Tredgold's treatise, of a provision for enabling the truck or wheel frames of said car with eight wheels, to swivel laterally to conform to the curves of the road.

On page 94, the following language is used: "When the carriage has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels." "In the case where 8 wheels are applied to support one body, if the body rests upon the wheel frame of each set of 4 wheels, in the middle of its length, (see fig. 26, pl. 4) and is connected with those frames so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure."

On page 179, "the body of the wagon rests on the wheel frames at A A, and is connected to them by an axis on which the frames turn, when from any inequality the axes of the wheels are not in the same plane." (See page 94.)

In answer to the twenty-third cross-interrogatory, he saith:

X 23. I understand Winans's invention to consist of springs or wheels connected together by two large springs, to the ends of which the boxes of the wheels are bolted; the longer leaves of the spring being placed downwards, and surmounted by the shorter leaves, which is united into a four-wheel bearing carriage, by means of their axles, in a bolster of the proper length, extending across from the centre of one spring to that of the other, and securely fastened to the tops of them. Upon this first bolster is placed another of equal strength, and reconnect the two together by a centre pin or bolt passing down through them, which allows them to swivel and turn upon each other, in the manner of a front bolster of a common road wagon.

All these things I find in the Allen carriage, not in the same combination; but the principle is, I believe, identical.

This claim is described on page 4 and 5 of Winans's specification.

To the twenty-fourth cross-interrogatory, he saith:

X 24. In the Quincy car we find the bolster, the centre pin allowing the swivelling motion in the manner of a common road wagon. These are described in Winans's specification, at the bottom of page 4, and at the top of page 5; the difference being that the wheels, instead of being united by a spring, as in Winans's patent, are in the Quincy car united by a strong rigid frame without springs.

The language of the specification to which I particularly refer, is to be found on page 5. "Upon this first bolster I place another of equal strength, and connect the two together by a centre pin or bolt passing down through them, and thus allowing them to swivel or turn upon each other, in the manner of the front bolster of a common road wagon."

To the twenty-fifth cross-interrogatory, he saith:

X 25. In the years 1829 and 1830, a mechanic of ordinary skill, having all the knowledge possessed by the world at that time about the construction of cars, would, in my opinion, have known what the requirements and characteristics of a railroad passenger car must have been,



to enable it to move safely and smoothly over the curves and irregularities of a railroad, as then or now constructed, at a rate of thirty miles per hour, and to perform the duties required of the ordinary eight-wheel cars now in use. He would have derived this knowledge—First, from the specification of a patent granted to William Chapman and Edward Walton Chapman, dated December 30, 1812, and to be found with a plate attached thereto, in the Repertory of Arts, &c., vol. 24, second series, p. 128. London, 1814.

The page to which I more particularly refer, is page 139 of said work.

Second, from "A Practical Treatise on Railroads and Carriages, showing the Principles of Estimating, &c." By Thomas Tredgold, Civil Engineer. London, printed for Josiah Taylor, 1825.

I refer particularly to page 94, and to plate iv, fig. 26, referred to in the text of that page, and described on page 179 of the work, being the first figure described on the latter page.

And lastly, from the Quincy car, and the Allen steam carriage, both of which contain the requirements and characteristics of the running gear of the ordinary eight-wheel cars now in use.

To the twenty-sixth cross-interrogatory, he saith :

X 26. I consider the arrangement of railroad car wheels, fixed firmly to their axles and rotating with them, to be the same in principle as those rotating loosely upon fixed axles.

To the twenty-seventh cross-interrogatory, he saith :

X 27. In the Quincy car the draft was applied to the middle longitudinal bearing piece of the truck.

To the twenty-eighth [?] interrogatory, he saith :

X 28. I should prefer applying the draft to the body of the car.

To the twenty-ninth cross-interrogatory, he saith :

X 29. The cars referred to in the interrogatory were four-wheel cars, and the wheels were attached to the bodies of the same.

To the thirtieth cross-interrogatory, he saith :

X 30. When the mode of applying the draft has been shown, it has, I believe, been represented as applied to the truck, in all cases.

To the thirty-first cross-interrogatory, he saith :

X 31. They would not. Placing the wheels of the trucks very near together would, in my opinion, cause the wheels to bind upon the rail, both on the curve and on the straight line, but more especially upon the curve, and would thus increase instead of reducing the friction between the flanges of the wheels and the rails.

To the thirty-second cross-interrogatory, he saith :

X 32. The drawings and descriptions referred to would not have taught such a mechanic, in the year 1830, that great stability of motion, when running at high velocities, would be attained by constructing the car body of great length, and supporting it at or near each end upon two trucks thus constructed.

To the thirty-third cross-interrogatory, he saith :

X 33. The drawings and descriptions referred to, would not so have taught a mechanic, in the year 1830.

To the thirty-fourth cross-interrogatory, he saith :

X 34. In the drawings and descriptions referred to, there is no such description or allusion.

To the thirty-fifth cross-interrogatory, he saith :

X 35. The purpose of the employment of eight wheels in a car or carriage, shown and expressed in the drawings and descriptions referred to, was solely for the purpose of carrying great weights, and dividing the weight equally on eight wheels, in order not to place a greater load on each wheel than they and the rails could well bear.

To the thirty-sixth cross-interrogatory, he saith :

X 36. As far as my knowledge extends, such eight-wheel cars or carriages were not employed previous to the year 1830, except to carry weights that could not be subdivided and carried upon four-wheel cars.

To the thirty-seventh cross-interrogatory, he saith :

X 37. I have not been employed by any person or persons, corporation or corporations, to assist in the preparation of the defence of this case, or to collect evidence to impeach the validity of the patent of Ross Winans, in controversy in this suit. I am not in any way connected with this case, excepting summoned to testify under the present commission, and am in no way interested in the result of this controversy.

To the thirty-eighth cross-interrogatory, he saith :

X 38. I am not connected in any way with any railroad company.

To the thirty-ninth cross-interrogatory, he saith :

X 39. I have formed an opinion that the letters patent of Ross Winans, now in controversy in this case, are invalid for want of novelty or originality. I formed this opinion after I examined the letters patent of said Winans, and compared the alleged invention therein described, with the previously existing cars or carriages, or descriptions inquired about in the direct interrogatories. I cannot recall any conversation with any person upon the subject of the novelty or originality of the said alleged invention of Ross Winans, before I made an examination of the letters patent and the comparison inquired. I had no such conversation.

To the fortieth cross-interrogatory, he saith :

X 40. I am not connected with any railroad or any association of superintendents.

To the forty-first cross-interrogatory :

X 41. I have not seen, heard, or had stated to me the substance of the foregoing interrogatories, or any of them, saving and excepting by the Commissioner.

The said Richard French, in answer to interrogatories marked "Further interrogatories to be addressed on the part of the Respondent," saith to the first interrogatory, in answer thereto :

1. During the thirteen years that I was the superintendent of motive power upon the Philadelphia, Germantown and Norristown Railroad, the eight-wheel car was in common use thereon, and no objection was made by said Winans to the use thereof. This is the only fact or circumstance known to me that I can mention in answer to the interrogatory.

To the second further interrogatory, he saith :

2. In my opinion it would not introduce any new mechanical principle, or any new mode of operation, into the Chapman, Tredgold, Allen, or Quincy cars or carriages, if (instead of the bodies or platforms now shown or described,) there should be substituted longer bodies,

retaining the same trucks or bearing carriages, and placing them under the body thus substituted, at the same distance from the respective ends thereof.

To the third further interrogatory, he saith :

3. It would not, in my opinion, require invention to made that substitution.

To the fourth further interrogatory, he saith :

4. There is nothing in the descriptions or drawings of the said Tredgold car or carriage, which renders it essential that all the wheels shall be equidistant from each other, and if two trucks are placed remotely from each other, under one body, by the substitution of a longer body, there is nothing in such remoteness of the trucks from each other inconsistent or incompatible with the said description or drawings, or with the objects and purposes set forth by said Tredgold in his said treatise.

To the fifth further interrogatory, he saith :

5. I make to this interrogatory the same answer as to the interrogatory next preceding.

To the sixth further interrogatory, he saith :

6. I make to this interrogatory the same answer as that made by me to the fourth further interrogatory.

To the seventh further interrogatory, he saith :

7. There is nothing in the said Quincy car, judging by the model thereof, and what I know of its structure and uses and mode of operation, which renders it essential that all the wheels thereof should be equidistant from each other, under one body. The change of a longer instead of a shorter body, (so that the same trucks should be coupled by the body remotely from each other, while the body should be supported at or near the two ends,) would in nowise be inconsistent or incompatible with the objects and purposes for which the Quincy car is designed and used.

To the eighth further interrogatory :

8. There is a difference between the mechanical theory of Ross Winans's arrangement of the wheels of a car, and the connection thereof with the body, and the mechanical theory of the running gear of the eight-wheel cars now in common use.

Winans places the fore and hind wheels of his bearing carriages very near together, connecting them by a spring, so that the two wheels on either side of the bearing carriage may act as nearly as possible as a single wheel, and bring the axles as near to each other as possible, thus causing them to approach more nearly to the radii of the curves of the road, in order to avoid lateral friction.

In the ordinary eight-wheel car, each truck having a rigid wheel frame, and the bearing points of the four wheels equidistant with the gauge of the track, the active and reactive forces are balanced about the king-bolt. The spring in the ordinary eight-wheel cars is confined in its action vertically to the truck, whilst the rigid wheel-frame holds the wheels square upon it. The ordinary eight-wheel car has two of these trucks connected with the body, by male and female transom plates and king-bolts, each truck being at a sufficient distance from the end of the body to protect it from collision.

To the ninth further interrogatory, he saith :

9. According to the specification of said Winans it is not necessary,

in order to accomplish the purposes claimed and stated by him, to use or employ very long bodies.

To the tenth further interrogatory, he saith :

10. If the axles of a truck are of the same length and parallel to each other, it will endeavor to move in a straight line, and it is essential to the proper and safe construction of eight-wheel cars, for rapid travelling, that the trucks should have very great freedom of swivelling to conform to the surface of the rails. The swivelling is limited by the flanges of the wheels at their bearing points. I do not wish to be understood as answering that the greatest possible freedom of swivelling is essential. There should be freedom enough to enable the truck to adapt itself to the shortest curve of the road upon which it travels.

R. FRENCH.

CHAS. HEAZLITT, }  
ROBT. P. KANE, } *Com's.*

In answer to the Plaintiff's cross-interrogatories, in addition to the original cross-interrogatories, he saith :

To the first additional cross-interrogatory :

1. I consider the theory of the Complainant to be, the placing of the fore and hind wheels of his bearing carriage very near together, with the design that the two wheels on either side of the bearing carriage may act as nearly as possible as a single wheel, and by bringing the axles as near to each other as possible, thus causing them to approximate to the radii of the curves of the road.

To the second additional cross-interrogatory, he saith :

2. The average rate of speed upon railways, prior to 1830, was, for freight cars, from 5 to 7 miles per hour. I do not know what the average speed was for passenger trains. Prior to that date, railroads were principally used for the transportation of freight.

To the third additional cross-interrogatory, he saith :

3. Railways, prior to 1830, were principally constructed of cast iron rails, of short lengths, resting on stone blocks; and distribution rather than concentration of the weight of the cars and of the locomotive was required.

To the fourth additional cross-interrogatory, he saith :

4. I do not know that there was more than one railway in England prior to 1830, upon which passengers were habitually carried.

To the fifth additional cross-interrogatory, he saith :

5. The use to which railways, prior to that time, were habitually put, in the course of their regular business, was the transportation of trains of merchandize by horse power.

To the sixth additional cross-interrogatory, he saith :

6. The average speed was, prior to that date, for freight cars, from five to seven miles; I do not know what it was for passenger trains.

To the seventh additional cross-interrogatory, he saith :

7. I have designed a number of railroad cars. They were eight-wheel freight cars. I cannot give the dates of each car. They were placed upon the Philadelphia, Germantown, and Norristown Railroad.

R. FRENCH.

CHAS. HEAZLITT, }  
ROBT. P. KANE, } *Com'rs.*



## DEPOSITION OF GEORGE W. SMITH.

DECEMBER 7, 1853. George W. Smith, being duly affirmed, on the part of the Respondents, deposeth and says as follows :

To the first interrogatory, he saith :

*First.* My name is George W. Smith, aged about 53 years, place of residence in the County of Philadelphia. I devote my attention to science, and principally to science connected with the arts.

To the second interrogatory, he saith :

*Second.* I have, from my earliest childhood, had a fondness for mechanical studies and for experimenting. I have read much and associated with scientific and practical men, have travelled extensively, in Europe and in this country, and am a member of several scientific and mechanical societies, and was one of the founders of the Franklin Institute for the Promotion of the Mechanic Arts, in this city, in the year 1824. I have been a very constant attendant at that Institute, and engaged with its committees in trying experiments and writing reports thereon, trying experiments also in Europe. For twelve years I have been chairman of the committee on meetings of the Franklin Institute, a committee to which is intrusted the management of all the business connected with science and arts and the discussion thereof in the monthly meetings of that body. At a very early age, (in my boyhood) I met with a work of Anderson, in which an extensive introduction of railroads for various new purposes was strongly advocated. In frequent conversations with a friend who devoted much attention to internal improvements, both in Europe and in this country, though no railroads then existed here, I felt a strong interest in both railroads and canals, and endeavored to procure all the information I could upon the subject. In 1820, I proceeded to Europe, and travelled there extensively for eighteen months, and subsequently paid two other visits, embracing altogether a period of five and a half years. My attention was immediately attracted to the railroads then in being, which I carefully examined as the first subject which most interested me. By this and subsequent examinations, and from investigations made before the committee of the Institute, and from reading books in the English and some other languages, and trying experiments on railroads, I have become practically acquainted with railroad machinery. I believe I am the earliest advocate now living in the United States, for the introduction of railroads into the United States.

To the third interrogatory, he saith :

*Third.* I am familiar with the mechanical principles of the construction and operation of the double-truck eight-wheel railroad cars, in general use on the railroads of the United States. I have not seen those in use on the Eastern Railroad, that I am aware of.

To the fourth interrogatory, he saith :

*Fourth.* I have examined the copy of the specification of the Letters Patent issued to Ross Winans, dated October 1, 1834, annexed to the said commission.

To the fifth interrogatory, he saith :

*Fifth.* I have examined the model B, now shown me by the Commissioner, and identified with my signature. It is a true representation

of the car described and recommended in said specification. It does not differ in any respect; in all respects it is the same.

To the sixth interrogatory, he saith :

*Sixth.* With the eight-wheel cars in common use on the railroads of the United States I can speak with knowledge. With regard to those used by the Eastern Railroad—not having seen them, I cannot speak of my own knowledge. The essential and elemental part and arrangements of said cars in common use, in order to enable them to run smoothly, evenly, and safely over the curves, straight track, and irregularities, are, first, the use of two trucks or wheel frames, made perfectly rigid and square, and firmly braced, to prevent change of form. Each truck is supported by four wheels, turning with their respective axles; the wheels being as far apart, from centre to centre, as the width of the track, the four points of contact of the wheels with the rails constituting the angles of a square. It is essential that the wheels should not approach much nearer to each other, or be much more remote than the distance mentioned; the diameter of the wheels is a question merely affecting the friction. The car body, of a length suitable to the purpose for which it was designed, is connected with the wheel frames of each truck, by a king-bolt, pivot, and socket, or other analogous contrivance, precisely in the centre of said frame, in order to equalize the bearing on the wheels. This point should be about seven feet from the end of each car body, which body should project beyond the wheel frames, to protect them from collision. These are the main essentials; there are others, however, of great importance, viz. : the proper form of the pedestals and springs, whether of steel, India rubber, or air, which will permit a vertical motion solely, and preserve the parallelism of the wheels. The safety beam of Kite is also an essential. There is a number of minor details that I do not deem it necessary here to state.

To the seventh interrogatory, he saith :

*Seventh.* I have before stated that I know nothing of the cars used on the Eastern Railroad, but the cars in general use upon the roads of this country have improvements or inventions applied to them, not described in said Winans's specification. They have pedestals and springs, mentioned in my last answer, the rigid wheel frame, the improved pivot, the male and female transom plate; the proper position and distance of the centre of the car frames from the ends of the car body; the improved brakes, the modes of lubricating the journals, the draw spring in the car body, the mode of ventilating the changeable seats, reclining chairs, improved wheels, check chains, to limit the motion of the trucks, and many other inventions and improvements that I do not now remember.

To the eighth interrogatory, he saith :

*Eighth.* The bodies of the said eight-wheel cars, now in common use, are so constructed as to be able to be removed from the trucks whenever desired, by taking out the king-bolt. The bolster of the trucks is usually placed about seven feet from the end of the framing of the body.

To the ninth interrogatory, he saith :

*Ninth.* Said cars have side bearings to limit the motion, to prevent rocking.

To the tenth interrogatory, he saith :

*Tenth.* Check chains are in use to prevent too much freedom of motion of the truck around its centre.

To the eleventh interrogatory, he saith :

*Eleventh.* Increasing or diminishing the length of the body of the said eight-wheel car, while the trucks are placed at the same distance from the ends of the body, does not introduce any new or different mechanical principles into the organization of the car, and does not require any exercise of invention ; it is merely a change of proportion.

To the twelfth interrogatory, he saith :

*Twelfth.* Such plan would be pre-eminently dangerous. It is absolutely essential, for safety in railroad travelling, to preserve the parallelism of the axles. The connection of the axles, by means of a long spring, would necessarily, in case of an obstruction, or in the unequal loading of the car, or when entering on curves, destroy such parallelism, and necessarily produce much oscillation and tendency to throw the wheels from the track. I consider the plan entirely impracticable.

To the thirteenth interrogatory, he saith :

*Thirteenth.* I have examined the drawing of the railroad freight car annexed to the commission. It does not show a car constructed with running gear in the manner particularly described and recommended in said specification. They differ in this :—*First*, The trucks themselves differ, by the substitution of a rigid wheel frame in lieu of the long spring, which alone connects the axles of the car described in the specification. *Second*, In the substitution of a spring to each wheel, in lieu of the single spring connecting the two wheels. *Third*, In the arrangement of the springs, the longer leaf or leaves being uppermost in the drawing, and the lowest in the specification. *Fourth*, In limiting the freedom of motion of the springs, in the drawing, by means of cast iron pockets. *Fifth*, In the removal of the wheels to a sufficient distance apart from each other to admit of the use of brakes, which are not described in said specification ; nor could they be safely used on a car constructed according to it. *Sixth*, In the use of a bolster forming part of the rigid wheel frame, in lieu of the movable common waggon bolster described in the specification. *Seventh*, The form of the pivot X, and socket Y, in the lower bolster E, in lieu of a centre pin or bolt, for swiveling, after the manner of a common waggon. *Eighth*, The withdrawal of the wheel frames to a greater distance from the end of the car body, rendering them safer in this position than in those described in the specification. *Ninth*, Checks on the motion of the car body, which are here introduced on the bolster, but not mentioned in the specification. *Tenth*, The draft is applied to the end of the car, by the apparatus now in common use ; no reference as to the mode of draft is contained in the specification.

To the fourteenth interrogatory, he saith :

*Fourteenth.* I have seen and examined the Repertory of Arts, Manufactures and Agriculture, vol. 24, Second series, published in London, A. D. 1814, more particularly that part of said volume which includes the specification and drawings of the patent of William & E. W. Chapman.

To the fifteenth interrogatory, he saith :

*Fifteenth.* I have examined the model K, now shown me by the Commissioner, and identified with my signature. Said model represents



the car described in page 139 of said book, and drawing facing 130, fig. 8, plate 1.

To the sixteenth interrogatory, he saith :

*Sixteenth.* A car builder of ordinary skill and knowledge of his profession, would be able, by aid of said specification and drawing, and without the necessity of exercising his own invention, to construct eight-wheel railroad cars substantially like those used on railroads generally, so far as respects the manner of arranging and connecting the eight-wheels and the connection of the trucks with the body of the cars. I cannot speak of the cars used by the Eastern Railroad Company, as I have not seen them.

To the seventeenth interrogatory, he saith :

*Seventeenth.* Said Chapman's car, as shown in said book or drawing, has side bearings, centre pivot, and rigid rectangular wheel frame.

To the eighteenth interrogatory, he saith :

*Eighteenth.* I have measured the distance between the bearing points of the wheels; the distance is sensibly equal to the width of the track.

To the nineteenth interrogatory, he saith :

*Nineteenth.* The model K, now before me, may be made to represent both the six and the eight-wheel carriage. It may be made to represent the six-wheel car by removing the forward truck, and substituting two wheels.

To the twentieth interrogatory, he saith :

*Twentieth.* I have examined a work called "A Practical Treatise on Railroads and Carriages, by Thomas Tredgold, published in London, England, in 1825, and the drawings referred to, and have long been familiar with the said work, from the year of its publication. In said book I find a description and drawings of a double-truck eight-wheel car.

To the twenty-first interrogatory, he saith :

*Twenty-first.* It is clearly described by Mr. Tredgold; and in plate 4, a diagram is given, which, in connection with the description, conveys a very clear idea of it. There are two wheel frames, wholly independent of each other, each comprising four wheels; the wheel frame is rigid and square. The wheel frames are so arranged as to preserve the parallelism of the axles, and braced so as to secure its strength. There is a pivot and socket in the centre of the frame, for the purpose of distributing the load equally on the four wheels; the transverse piece of timber, or bolster, is secured to the side piece, on either side, by a bolt. No springs are represented in the engraving, which is a mere diagram, although he recommends the use of springs for passenger carriages, and for various kinds of cars for goods. No mode of drawing the car is represented, but the mode in common use at that time, was by a chain from the centre of the end of the carriage body, engravings of which are given in plate I, of said work. The wheel frames are placed so far from the end of the car body, that its projection will protect it from injury. The car, with the exception of the springs, will operate as the common eight-wheel cars now generally in use. The pivot or bolt situated in the centre of the frame will allow motion around it. There does not appear to be any check to this motion represented in the diagram, such as we have now in use; but the essential principle,



viz., the rigid wheel frames for the preservation of the parallelism of the axles, is the same, and the operation is the same.

To the twenty-second interrogatory, he saith :

*Twenty-second.* I have examined model A, now shown me by the Commissioner. It is a correct representation of said eight-wheel car of Tredgold. The mode of drawing of the car presented by the model is not given in the diagram, which is evidently intended to represent merely the general principle, and is not a finished drawing with all the details. I have examined model C. It is not a correct representation of said eight-wheel car of Tredgold, or of any car described by him. In lieu of the motion described by Tredgold, viz. that of the motion of the rigid wheel frame around the centre of the pivot, for the purpose of equalizing the load on all the wheels, I find the transverse piece connecting the two parallel side pieces, firmly connected to the bottom of the car body, admitting no motion whatever between said piece and the car. I find also another deviation from the plan of Tredgold ; the side pieces of the truck or wheel frame are perforated by a large circular aperture, which would very much weaken the said side pieces ; the said aperture is for the purpose of admitting a journal, in order that said side pieces with their accompanying wheels and axles may have motion in a vertical plane. In Tredgold's plan, on the contrary, said side pieces are evidently merely bolted to the central transverse piece. The model (C) only resembles Tredgold's in having eight wheels connected in fours together, and its mode of action is directly the reverse.

To the twenty-third interrogatory, he saith :

*Twenty-third.* With regard to the Eastern Railroad, I have already answered. With regard to the others, the eight-wheel cars of said Tredgold, so far as regards the running gear, are in their mechanical principles and mode of operation substantially the same. There are some slight variations and improvements not affecting the general principle, which have been made ; as for instance, the use of outside bearings.

To the twenty-fourth interrogatory, he saith :

*Twenty-fourth.* The Tredgold car is calculated to conform to all the irregularities of the railroad, and to accomplish the objects stated in the specification of said Winans, as designed to be accomplished by him ; but in a practical manner.

To the twenty-fifth interrogatory, he saith :

*Twenty-fifth.* I have seen and examined a copy of the letters patent of the United States, granted to Jonas P. Fairlamb, dated January 19, 1833, and the drawings and specification attached. The drawing shows two-wheel frames placed under a car body. One of those wheel frames, viz. the one to the right hand, is constructed in the ordinary manner of the eight-wheel trucks now in use on the roads of the United States, with the exception that the wheels are closer together than the width of the track. The closeness of the wheels resembles, in some respects, the plan described by Winans in his specification, but the wheel frame being rigid, and intended to preserve the parallelism of the axes, differs essentially from the connecting spring of Winans, and resembles the car-frames now in use. The dimensions of the timbers of the frame appear to be less than the corresponding parts now in general use. The circular rings, or plates A, are different from the pivot of

Winans, and rollers are introduced which are not in Winans's. If the wheel frame to the left in the drawing were similar to the wheel frame on the right, then such arrangement would be similar in all essential principles to the plan of running gear now generally in use upon the eight-wheel cars of this country. The rollers and circular rings are, however, peculiar to Mr. Fairlamb's plan. In the wheel frame to the left, a mode of destroying parallelism of the axes is introduced by Mr. Fairlamb, of a very injurious character, and would have a similar evil effect to the long spring of Mr. Winans, although the mode by which it would be accomplished is different.

To the twenty-sixth interrogatory, he saith :

*Twenty-sixth.* A mechanic of ordinary skill in car-building, having knowledge of said Fairlamb's patent and drawing, would be enabled, without exercising invention, to construct eight-wheel cars substantially like those now in common use on the roads of the United States. I do not, except from hearsay, know what is the construction of the eight-wheel cars used by the Eastern Railroad. I believe that eight-wheel cars so constructed would embody the essential principle of the eight-wheel railroad car now in common use, and would attain the beneficial results pretended to be obtained by said Winans in his said patent. My answer has reference to the use of two such wheel frames as the one represented on the right side of the drawing of Fairlamb's patent, Fig. 2. A greater distance would, however, be required between the bearing points of the wheels upon the rails, than that given in the drawing.

To the twenty-seventh interrogatory, he saith :

*Twenty-seventh.* The drawings stated as marked G and H, have not been shown to me. The model is now before me, and I have now examined it. The mechanical principles of the construction and arrangement of the running part, are calculated to obtain the practical benefits of the eight-wheel railroad cars now in general use, and the construction and arrangement of the running gear are substantially the same as these. It does contain the construction and organization necessary to produce the beneficial results stated and claimed to be accomplished in the said Winans's specification, of October the first, 1834. The mere difference in the size of the wheels is immaterial. The points in which it resembles the invention described by said Winans, in said specification, are in having two four-wheel wheel-frames placed under an engine and boilers, which are substituted here for the car body; such substitution not affecting the principle of the construction and arrangement of the running part. The Allen steam carriage, however, differs materially from the description in the specification of the said Winans, in the following respects.

*First.* In the model of the Allen Steam Carriage, there are two rigid wheel-frames, which maintain the axles in a state of parallelism to each other; the distance between the centres of said axles being equal to the width of the track. The single spring of Winans, which alone connects the axles together, according to the specification, is not to be found in the Allen carriage; but springs are attached to each wheel, and by means of pedestals, the action of the springs permits motion only in a vertical direction. Rollers are also employed in the Allen carriage to support the car body, and to ease its movements.

The cross-piece or bolster, in the Allen carriage, is firmly attached to the wheel-frame. In the Winans wheel-frame there is only a common wagon bolster. The mechanical principles of the arrangement and construction of the running part of said Allen's steam carriage, consist in the employment of two rigid wheel frames, which insure the parallelism of the axes at the same distance apart as the width of the track, and the adaptation to the curves of the road by the swiveling movement around the centre pivot of each wheel frame. It may be well to add that the former part of this answer embraces the remaining principles of the running part.

To the twenty-eighth interrogatory, he saith :

*Twenty-eighth.* I have examined the model of the eight-wheel double-truck railroad car now before me, marked "G. Bryant." It consists of two wheel frames, framed so as to be perfectly rigid. Each frame has four wheels of small diameter (presuming the track to be of the usual width,) each loose and moving on the axle, which is fixed. The distance from the bearing points on the rail of these wheels is equal to the gauge of the track. At the centre of these rigid frames is a cavity, containing the pivot on which the platform, which connects the two wheel-frames together, can freely swivel. The platform, as it may be so called, extends only from the centre, or from a little beyond the centre of each wheel frame, and does not therefore extend outside the wheel frame. The traction is from the centre of the wheel frames, at one end, and not from the platform, in the usual manner. There are also side plates, on which the bolster of the platform is supported at the ends, to render the motion easier. There are also transom plates about the central pivot, above and below.

The mode of operation is permitting an independent motion of each wheel frame about its central pivot, and the preserving the parallelism of the axes by means of the rigid wheel frame. The Quincy car, however, is not so well adapted to either a straight track or curve, in consequence of the looseness of the wheels upon the axles, as it would be if they were firmly attached to the axle and revolved with it, although it would doubtless move on the track, whether straight or curved, but not with equal safety or certainty. Whether the axle be fixed and the wheel revolve on it, or whether the axle and wheel be united so as to revolve together, I consider the same in principle, inasmuch as they may be regarded as mechanical equivalents. I cannot, of my own knowledge, state whether it is constructed and operated upon the same mechanical principles as the cars used on the Eastern Railroad, as I cannot remember having examined said cars, nor has a model of them been shown to me. It is, however, constructed and operated upon the same mechanical principles as those in general use upon the railroads of the United States, so far as the wheel frames, and the apparatus for swiveling. The platform or bearing carriage, would, in that case, be substituted by the ordinary car body projecting beyond the wheel frames, as is usual, regard being had to the substitution of the mechanical equivalent just mentioned, to wit, the axles revolving with the wheels, and not on them. At the time of the construction of this car, namely, 1829, and long prior thereto, the very few railroads in the United States were exceedingly crooked, having numerous sharp and severe curves, compared with those now made. The same was also the case in Europe.



To the twenty-ninth interrogatory, he saith :

*Twenty-ninth.* The only thing described in said Winans's specification as new, appears to me to be the use of a long spring uniting the boxes in which the axles move, and a common waggon bolster resting on the centre of said spring, on each side, to which it is attached. Double truck or wheel frames are common to both, although constructed on totally different principles; both have platforms permitting the trucks to move beneath them.

To the thirtieth interrogatory, he saith :

*Thirtieth.* A mechanic of ordinary skill and knowledge in building railroad cars, having knowledge of the aforesaid Quincy car, in 1829 or 1830, would have been able, at that time, without the exercise of invention of his own, to construct double-truck eight-wheel railroad cars substantially like those in general use, so far as regards the arrangement of the wheels and the connection of the trucks with the body of the cars.

To the thirty-first interrogatory, he saith :

*Thirty-first.* I have seen and examined all the works in question, and am perfectly familiar with them. Prior to 1830, the mode of drawing railroad cars by a coupling from the middle of the end of the body, was well known and publicly used, and is shown and described in a number of printed works, in addition to those of Wood, Tredgold and Strickland, above referred to. The engravings contained in said works are referred to in evidence.

To the thirty-second interrogatory, he saith :

*Thirty-second.* I have examined the said last mentioned printed works. The distance of the bearing points of the wheels of Strickland are a little further apart than the width of the track, not much, in a very slight degree. In Tredgold, the distance is sensibly the same, to wit, the distance between the centres of the wheels and the width of the track.

In one instance, in Wood, the distance from centre to centre of the axles is rather less than the width of the track; in another, it is the same width as the track. The distance of the wheels in the best constructed cars now in use in the United States, from centre to centre, is equal to the gauge of the road on which they are used.

To the thirty-third interrogatory, he saith :

*Thirty-third.* Springs and pedestals, as now used on the eight-wheel, double-truck cars, were applied to the four-wheel cars described and shown in the American edition of Wood's treatise, in 1832, and in said Allen's model.

To the thirty-fourth interrogatory, he saith :

*Thirty-fourth.* The mode of causing the wheels of railroad cars to revolve with the axles, was a well-known equivalent before 1830, for the mode of causing them to revolve on the axletrees. These equivalents were described and shown in Wood, Strickland, and others, prior to that date.

To the thirty [?] cross-interrogatory, he saith :

*Thirty-fifth.* It does not, in my opinion, involve any change in the mechanical principles or modes of operation in said Quincy car, to substitute for the axletrees axles revolving with the wheels; or larger



wheels instead of those used, so as to cause the flanges of the wheels on each truck to approach very near each other; or to draw the said car by the body, instead of drawing it by the truck; or to increase the length of the body of the platform; or to place a box upon the top of the said platform, so as to become a passenger car; or to cause it to run at any greater or less rate of speed. It would not, in my opinion, require invention to make any and all of these changes.

To the thirty-sixth interrogatory, he saith :

*Thirty-sixth.* The distance of the flanges from each other, is not, of itself, material. What is material, is the distance of the points where the wheels touch the rails, compared with the gauge of the track; the nearer the four points approximate to the angles of a square the better is the proportion. The distance may be varied, by increasing the diameter of the wheels without changing the mechanical principles or mode of operation of the car, inasmuch as the point of contact of the wheels on the rails would remain the same as the width of the track. Such increase in size, of course, has a limit, which must not exceed the width of the track, and in fact be less, in order to admit the operation of the brakes.

To the thirty-seventh interrogatory, he saith :

*Thirty-seventh.* The distance of the bearing points upon the rails, of the wheels in each truck, is material and essential to the operation of the car, or if that distance be materially less than the gauge of the track, great vibration will necessarily result, even on straight lines, and much more on curves, in consequence of this oscillation and vibration, which will necessarily be produced from approximating the axles and the wheels too near together. Every shock produced by the contact of the flanges with the rails, or any irregularity of them, will be multiplied to a great degree. If, on the contrary, the distance of the wheels apart be greater than what we have recommended, the friction, in curves particularly, of the flanges, will be greatly increased.

To the thirty-eighth interrogatory, he saith :

*Thirty-eighth.* It is material and essential, in the construction and operation of the eight-wheel car, that the axles of the wheels in each truck should be maintained at a fixed uniform distance from each other, for the same reasons that I have given in Int. 37.

To the thirty-ninth interrogatory, he saith :

*Thirty-ninth.* I do not know anything further than I have stated, material or advantageous to the Defendant in this suit.

To the fortieth interrogatory, he saith :

*Fortieth.* The theory of the said Winans appears to approximate to correctness much more than his method of reducing that theory to practice, which appears to me to be eminently defective, inasmuch as the practical operation of railroad cars, constructed according to said theory and specifications, would necessarily be bolting the track; the freedom of motion and departure of parallelism of the axles, necessarily consequent upon the adoption of the plan, as given in his specification, would be to produce a constant oscillation or vibration in the cars, and render them pre-eminently dangerous, inasmuch as the long spring, which alone controls the movement of the axles, would permit them to move in a countless number of planes, with nothing to steady them. All ob-

servations and experiments which I have tried upon railroads satisfy me that nothing but rigid wheel frames, with the axles at a proper distance apart, and their parallelism unalterably preserved, would insure a safe and steady motion in trucks or cars; and I have been an attentive observer of railroads and their machinery for upwards of a third of a century.

To the first cross-interrogatory, he saith :

*First X.* I have been engaged in experimenting and occasional construction of models of machines from my boyhood. I have frequently assisted in the arrangement and putting together of machinery, and have often, as one of a committee, examined machines, and tried experiments with them, in conjunction with engineers, and have been appointed on many committees for such purposes, by the Franklin Institute of the State of Pennsylvania for the Promotion of Mechanic Arts.

To the second cross-interrogatory, he saith :

*Second X.* I have been and am particularly conversant with the construction of the running apparatus of railroad cars and carriages, and have paid much attention thereto, merely for the purpose of gratifying my curiosity, and, in consequence of the deep interest I have felt in different branches of mechanics, and especially in railroads, a branch to which I have paid more attention than any other, for a period of upwards of thirty-three years, and in a desultory manner for a longer period. I edited and annotated an edition of Wood on Railroads, which was published by Carey and Lea, of Philadelphia, in 1832, prior to which date I had written a large number of pamphlets on the subject of railways, some of them as far back as 1824. They were distributed gratuitously throughout the United States. I also, at that early period, had many times called the attention of the public to this subject, through the press.

To the third cross-interrogatory, he saith :

*Third X.* I have been examined as an expert in courts of justice in patent cases, although I do not wish to be considered as an expert. I have been examined so frequently, that I cannot state the number of times, principally upon questions connected with machinery, mill work, saw mills, hydraulic presses, lead-pipe manufacture, railroads and their machinery; and I do not remember upon how many other matters; and I would have been examined much more frequently, had I not declined whenever I properly could, what is a most irksome and disagreeable task, and which has occupied a most unreasonable portion of my time.

To the fourth cross-interrogatory, he saith :

*Fourth X.* I have been much accustomed to the examination and comparison of machinery, with a view to forming and expressing or acting upon an opinion as to the substantial identity between two or more machines, or combination of apparatus, particularly for the last twenty-nine years, since the formation of the Franklin Institute, having been one of its founders, in 1824, and always an active member. In the Committee of Science and Art of that Institute, of which I am a member, I have been frequently appointed upon sub-committees, to examine the originality and utility of various inventions submitted to them, and for years I believe was placed upon more than one half of

such committees. Such investigations demanded and secured my most zealous efforts. I have also frequently been consulted, by engineers, patentees and inventors, in relation to mechanical subjects in which the parties were interested. It has been my duty also, as chairman of the committee on meetings of the Institute, for about twelve years, to explain to the monthly meetings all such machines and inventions of every class as came before the Institute; which duties necessarily required me to study the subjects to which they referred.

To the fifth cross-interrogatory, he saith :

*Fifth X.* I am not a civil engineer, although I have studied civil engineering. I am not an engineer, superintendent or other officer or employe of any railroad.

To the sixth cross-interrogatory, he saith :

*Sixth X.* I have some theoretical knowledge of railroad engineering, and have had some practical knowledge also; and I believe that I fully understand the principles involved in the construction and operation of railroad cars of various kinds in general use, although it is probable that there are varieties of cars, both in this country and abroad, which I have never seen or heard of. I am acquainted with and fully understand, I believe, the properties essential to their proper operation under the present condition of railroad construction and engineering. I refer, of course, to the cars in general use.

I have such a knowledge of the subject as will enable me to compare the different construction of cars, and to judge therefrom whether they are practically adapted to answer the purposes required of railroad cars, under the conditions of high rates of speed, steadiness of movement, and the curvatures and irregularities of the road, commonly found in the working of railroads in this country.

To the seventh cross-interrogatory, he saith :

*Seventh X.* As I am not by profession an engineer, I can merely express my private opinion that it is important and essential to the proper operation of any car, whether of four, six, or eight wheels, that it should be able to move round curves in the road with the least practicable friction between the flanges of the wheels and the rails.

To the eighth cross-interrogatory, he saith :

*Eighth X.* The friction between the flanges of the wheels and the rail is proportionate, correctly speaking, not to the resistance which the wheels offer to the guidance of the rail, but to the resistance which the rails, the fixed body, offer to the movement of the wheels.

To the ninth cross-interrogatory, he saith :

*Ninth X.* The wheels of a four-wheel car or of a truck of an eight-wheel car, will not run upon a curve with less friction between the flanges and the rails, the nearer the axle of the wheels are to each other, for the reason that there will be much more oscillation upon entering a curve; the reasons for which have been given in my previous answers.

To the tenth cross-interrogatory, he saith :

*Tenth X.* The wheels of the truck of an eight-wheel car, independently from other considerations, will not run upon the curve, and over the irregularities of the road, and yield to the guidance of the rails with the least friction when the trucks have the greatest freedom of motion. The greatest freedom of motion cannot be given even to trucks without

detriment, as it would ensure violent oscillation and bolting from the track.

It is hence necessary to restrain the freedom of such motion by various contrivances which are common to all properly contrived eight-wheel cars.

To the eleventh cross-interrogatory, he saith:

*Eleventh X.* I am, both from personal knowledge and reading, sufficiently acquainted with the state of railroad engineering, at and before the date of said Winans's patent, and particularly prior to 1830, to compare the present advanced state of railroad engineering with what then existed.

My means of knowledge are much travelling, both in Europe and in this country, from 1820 to the present time, making it a point to examine every thing connected with railroads, and reading every book on the subject which appeared to have any merit, and to which I could have access; and frequent discussions and advising with engineers, superintendents, inventors, and others.

To the twelfth cross-interrogatory, he saith:

*Twelfth X.* In my opinion it is important and essential to the running of cars at high speeds, such as have been practised since 1834, that they should be made in such a manner as to insure greater steadiness of motion than was attained by the four-wheel cars. It is not my opinion that making the car body of great length, as compared with the modes before practised, and supporting the same at or near its ends, are essential to the attaining of greater steadiness of motion at high velocities than would be obtained by the four-wheel cars, as formerly constructed. The car body of great length would be subject to objectionable vibration, as compared with one, say of sixty [?] or fifty feet, particularly if the longer car be supported at or near its ends, instead of at the customary distance of seven feet from the end of the platform.

To the thirteenth cross-interrogatory, he saith:

*Thirteenth.* It is, in my opinion, essential to the proper construction of an eight-wheel car, that it have the capacity to work with other cars in a long train, and in any part of the train in which it may be placed.

To the fourteenth cross-interrogatory, he saith:

*Fourteenth X.* It is important and essential to the proper working of the first car in a train, that while it is subjected to the whole draft of the train, its trucks shall have the same freedom of motion as any other truck in the train has. The effect of the draft, however, of a long train would have a tendency to increase the steadiness of the first car.

To the fifteenth cross-interrogatory, he saith:

*Fifteenth X.* It is important, but not absolutely essential, in order to give freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to the trucks, nor act through them; the best mode of applying the draft is to the centre of the end of the platform of the car.

To the sixteenth cross-interrogatory, he saith:

*Sixteenth X.* The model B represents the car as described in the Plaintiff's Patent, in the extent of bearing surface between the bolsters;



but the model does not represent the extent of bearing surface between the bolsters, as shown in the drawing of a freight car attached to the commission, which drawing does not correspond with the specification of Ross Winans in his patent, and which drawing has lateral bearings, which are not mentioned in the specification.

To the seventeenth cross-interrogatory, he saith :

*Seventeenth X.* The model B does not show the mode of attaching the draft, as is represented in the drawing of the Plaintiff's patent ; nor does the Plaintiff, in his specification and description, show any method of attaching the draft to either platform or truck.

To the eighteenth cross-interrogatory, he saith :

*Eighteenth X.* The Plaintiff describes a spring of double the usual strength, the ends of which springs are bolted to the upper side of the boxes which rest on the journals of the axles—the longer leaves of the springs being placed downwards and surmounted by the shorter leaves. Having thus connected two pair of wheels together, he unites them into a four-wheel bearing carriage, by means of their axles and a bolster of proper length extending across between the two pair of wheels, from the centre of one spring to that of the other, and securely fastened to the tops of them. This spring and the framing of the truck is described as an essential part of his invention,—placing the wheels very close together so as to act as one wheel, and the axles to approximate to the radii of the curve, in contradistinction to the plan in present use, of rigid wheel frames,—preserving the parallelism of the axles, holding the wheels true and square upon the track, and at a proper distance apart, from centre to centre, say the width of the track.

To the nineteenth cross-interrogatory, he saith :

*Nineteenth X.* I consider the use of springs essential to the proper construction of all cars, whether of eight, six, or four wheels, inasmuch as they facilitate the draft, lessen shocks, and tend to the preservation of both rail and rolling stock, and are absolutely indispensable at high velocities.

To the twentieth cross-interrogatory, he saith :

*Twentieth X.* The description and drawings of the Chapman engine, inquired of in the fourteenth direct interrogatory, does represent a railroad car like model K. The mere fact of its containing or not containing any motive power within it or on it, renders it neither more nor less a car. Although unscientific persons, using language in its ordinary acceptation, might perhaps call it an engine locomotive or otherwise, according to its nature, rather than call it a car. It is, in point of fact, a car, and strictly and properly speaking may be called one.

Plate V, vol. 24, second series, Repertory of Arts, opposite to page 130, and referred to therein, being part of the specification and accompanying drawings of the patent granted to the Chapmans, is styled a carriage supporting or containing an internal self-moving power.

Line 7th of the same page :

"We also, as the carriage containing the motive power will, thus loaded, be too heavy in various cases for the strength of the existing iron or wooden rails, if resting on four wheels only, so arrange it for such ways (or other confined ways, where the ledges either of the ways or of the wheels regulate the direction of the carriage,) that it may rest equably, and move freely round curves or angles, either on six or eight

wheels, so as to reduce its pressure on each in the inverse proportion of its number of wheels. Having thus described the outlines of the separate leading parts of our invention, we shall proceed to the means of carrying them into effect."

Also, on page 139, the description of Fig. VIII :

" Fig. VIII shows a carriage of six wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels, are, as usual on railways, fixed to the body of the carriage; 2, 2, and 3, 3, the other two pair, are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised, as that two thirds of its weight should lie over the central point of the four wheels, where the pivot 4, is placed, and the remaining third over the axis, 1, 1. The two-thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates *c, c*, so as to admit the ledges of the wheels or those of the way, to guide them on its curves or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal wagon; and if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis, 1, 1, a transom, such as described, (laying the weight equably upon both), and then similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway."

The draft was by means of a chain attached to some point on the railway, and passing over rollers and wheels, moved by whatever motive power—steam, hand, or other, and drawn thereby towards the fixed point; and as action and reaction are equal, whether the chain be fixed at said point, and the car or carriage be drawn towards it by any motive power placed on the car, or whether the chain be attached to the car, and drawn towards the fixed point aforesaid, by means of any motive power placed at said point, is immaterial. The draft is applied, in the Chapman car, to the centre of the front of said car, Fig. I, which is a single carriage; but in fig. VIII, plate V, aforesaid, which represents a car with two trucks, the draft would necessarily be from the front of the platform, and not from the truck.

To the twenty-first cross-interrogatory, he saith :

*Twenty-first.* In the drawings and description in the treatise by Thomas Tredgold, of a carriage with eight wheels, there is no representation or description of a draw link attached to the end of the body, as is shown in the model A. Nor is any method, or description, or drawing given, to show the mode of draft. The drawing, so called, is a mere diagram, not finished or illustrated with any details, but meant merely to illustrate the essential features of the eight-wheel car. As some method of draft must necessarily be taken for granted, the ordinary mode of attaching cars, and thereby drawing them, is given in plate first, fig. I, of the same work of Tredgold, which represents a train of the common four-wheel cars, and where the links are connected, from one platform to the other, and thus the missing link in the diagram would be supplied in the mind of any ordinary mechanic.

To the twenty-second cross interrogatory, he saith :

*Twenty-second.* In page 94, of Tredgold's treatise, there is a provision for enabling the truck or wheel frames of said car, with eight wheels, to swivel laterally, to conform to the curves of the road. The description and drawing illustrated of it, are to be found on pages 94 and 95 of the treatise, and figure 26, plate iv, referred to on page 94. I make the following extracts, which, with the figure mentioned, must be taken together. "When a carriage has more than four wheels the body must be sustained, so that its pressure may be divided equally among the wheels. In the case where eight wheels are applied to support one body, if the body rests upon the wheel frame, of each set of four wheels, in the middle of its length, (see figure 26, plate iv,) and is connected with those frames, so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure." "The load on each wheel must be limited to suit the strength of the rails; it will seldom exceed two tons on a wheel, nor be less than half a ton. The size of the axles may therefore vary from 2.2 inches to 3.5 inches. Perhaps the most advantageous load will be about one and a quarter tons on each wheel, which will require an axis of three inches diameter." In page 93, of the same work, Tredgold states that "carriages for passengers and for various kinds of goods, must be provided with springs, to reduce the force of these shocks." In plate iv, figure 26, the diagram manifestly shows a king-bolt or pivot, resting on the centre of the wheel frame, and permitting motion of the said frame around it. The springs not exhibited in the diagram, but recommended as aforesaid, would tend, in conjunction with the swiveling laterally, to conform to the curves of the road.

To the twenty-third cross interrogatory, he saith :

*Twenty-third X.* The points or parts of the said Winans's invention, embraced in the model of the Allen steam carriage, are : First, "Two bearing carriages, each with four wheels, which are to sustain the body of the passenger or other car, by placing one of them at or near each end of it." I quote the language of page 4th, of the specification, lines 14, 15 and 16, from the bottom of the page.

Second, The construction of these bearing carriages, so as to swivel about the central pivot or king-bolt.

Winans has a bolster extending across between two pair of wheels, securely fastened to the tops of his springs. He says, in his specification, page 5, lines 1, 2, 3 and 4, from the top of the page : "Upon this first bolster I place another of equal strength, and connect the two together by a centre pin or bolt passing down through them, and thus allowing them to swivel or turn upon each other, in the manner of the front bolster of a common road waggon."

To the twenty-fourth cross-interrogatory, he saith :

*Twenty-fourth X.* The points or parts of the said Winans's invention, embraced in the model of the Quincy car, are the same as those that I have referred to in my answer to the last interrogatory.

To the twenty-fifth cross-interrogatory, he saith :

*Twenty-fifth X.* With my knowledge of what was the state of railroad engineering and science, in 1829 and 1830, I would answer, decidedly, that a mechanic of ordinary skill, having all the knowledge possessed by the world, at that time, about the construction of cars, would not have known what the requirements and characteristics of a



railroad passenger car must have been to enable it to move safely and smoothly over the curves and irregularities of a railroad, as then or now constructed, at a rate of thirty miles an hour, and to perform the duties required of the ordinary eight-wheel cars now in use. For, with all the improvements that have been made in railways, cars, locomotives, and their general management, it is a lamentable fact that, even now, 1853, frequent accidents demonstrate that we cannot move safely and smoothly over the curves and irregularities of railroads, as now constructed, at the rate of thirty miles an hour, with any kind of car whatever; much less could the cars constructed according to the knowledge of those days, whether with eight, or any number of wheels, perform the duties required of the ordinary eight-wheel car now in use. The great majority of railroads then existing in Europe, and the few in this country, had such numerous, sharp and severe curves as would totally preclude the attainment of a velocity of thirty, or even a much less number of miles per hour. There was no source from which such information could have been satisfactorily derived, except from experience, and that was yet to be had. The experiments on the Manchester and Liverpool railways, at high velocities, must be considered as the first that were reliable. These experiments were made in 1829, prior to the opening of the road, and subsequently.

To the twenty-sixth cross-interrogatory, he saith :

*Twenty-sixth X.* I do consider the arrangement of railroad car wheels, fixed firmly to their axles, and rotating with them, to be the same in principle as those rotating loosely upon fixed axles.

To the twenty-seventh cross-interrogatory, he saith :

*Twenty-seventh X.* I know where the draft was applied to the Quincy car, from the model alone; it is applied, in the model, to the end of the truck.

To the twenty-eighth cross-interrogatory, he saith :

*Twenty-eighth X.* Draft may be applied either to the truck or the body, and it is so done in practice; but I do not consider it a matter of indifference, especially where there are trains of cars. The draft is better applied to the end of the bodies of the cars.

To the twenty-ninth cross-interrogatory, he saith :

*Twenty-ninth X.* The cars described in the works of Wood, Tredgold, and Strickland, referred to in the thirty-first interrogatory, and having the draft applied to the middle of the ends of the body, were four-wheel cars. From the works of Wood, Tredgold, and Strickland, it would appear that the wheels of such cars were attached to the body.

To the thirtieth cross-interrogatory, he saith :

*Thirtieth X.* The only instance that has come to my knowledge of the employment, prior to the invention of the Complainant, of eight wheels arranged in bearing carriages or trucks, to sustain an independent body, in which the draft has been represented as applied to the truck instead of the body, is the Quincy car; and of this I must be understood as speaking from the model, for I do not now recollect whether the draft in the original Quincy car was applied to the truck or to the body.

It was customary, in all four-wheel cars, when connected together, to have the draft from the end of the body, and in eight-wheel cars the same obviously would be used as the most convenient mode. The invention of the Complainant, so called, does not embrace any particular



mode of draft; none such is mentioned in the specification; and the drawing of a freight car shown me as annexed to this commission and alleged to be the Complainant's, does not correspond with his specification in this as well as many other respects.

In the Chapman car, when placed on two trucks, a platform would be indispensable, and the draft would necessarily be from the platform or body. This is the only instance that occurs to me, at this moment, of the application of the draft to the body of eight-wheel cars, prior to the Complainant's invention; although I have no doubt that such was usually the mode of draft.

To the thirty-first cross-interrogatory, he saith :

*Thirty-first X.* The drawings and description of the Chapman engine, the drawings and description in Tredgold's Treatise, the model of the Allen locomotive, the model of the Quincy car, would either or all of them teach a mechanic of ordinary skill and knowledge of cars, in the year 1830, that placing the wheels of the trucks very near together, of the degree of nearness which all those drawings or models show, could reduce the friction between the flanges of the wheels and the rail over curves, inasmuch as that distance is the same as the gauge of the track, or nearly so; and that distance had been ascertained by long experience with four-wheel cars to be the best for reducing the friction, producing uniformity in the motion of the truck, and essential to its safety by retaining it on the track.

Placing the wheels of the trucks very near together, may mean placing them so near that the flanges should barely not come in contact, as described in Winans's specification, or, any greater distance apart materially less than the width of the track. Any mechanic of ordinary skill and knowledge in the construction of cars, in the year 1830, or even prior to that date, would know that in a single four-wheel car with rigid frames holding the axles parallel, which each truck is, that when the distance between the axles greatly exceeds the width of the track, it would effectually preclude the movement of the truck upon curves; that when this distance is lessened, but still remaining greater than the width of the track, the resistance of the rails to the flanges would be lessened, and the proper distance between the axles of the truck would be that of the gauge of the track, or nearly so. Where it is materially less, there is too much freedom of motion in the wheels on the rails, and the friction between the flanges of the wheels and the rails would be increased instead of reduced.

If the arrangement of wheels be as in the Winans's specification, (I quote the language of page 6, eighth line from the top of the page,) where "the two wheels on either side of one of the bearing carriages may from their proximity be considered as acting like a single wheel," such approximation would cause the car wheels, when encountering any obstacle or curve, to have great irregularity of motion, attended with the danger of running off the track. If, for instance, a single axle connected with two wheels, and rotating with them, be placed on the track and set in motion thereon, the result would inevitably be a speedy bolting from the track.

To the thirty-second cross-interrogatory, he saith :

*Thirty-second X.* I answer that a car body of great length, supported in the manner described in the interrogatory, would not possess

great stability of motion when running at high velocities. The drawings and descriptions referred to, would not have taught such a mechanic, in the year 1830, that the contrary would be the case.

To the thirty-third cross-interrogatory, he saith :

*Thirty-third X.* The trucks,—in order to move over the curves and irregularities of a railroad, at a high velocity, with safety and stability of motion, and with the least practicable friction on the rails,—should not have the greatest possible freedom to conform to this surface. They should also be constrained by the draft, inasmuch as the foremost trucks of the train, which are constrained by the draft of those following them, have more safety and stability of motion with the least practicable friction on the rail. The drawings and description referred to in the interrogatory would not have taught such a mechanic, in the year 1830, the contrary of this.

To the thirty-fourth cross-interrogatory, he saith :

*Thirty-fourth X.* I do not find in the drawings and descriptions referred to, any description of or allusion to any arrangement or modification in the construction of railroad cars, by which they might be run at high velocities, such as have been practised since 1830. The various arrangements for safety, such as Kite's safety beam, improved male and female transom plates, check-chains, patent lubricating boxes, patent brakes, and a number of other contrivances, none of which are contained in the specification of Winans's patent, and most of which have been introduced since 1830, enable a high velocity, such as has been practised since that date, to be maintained with less danger than prior thereto.

I have no doubt, however, that prior to 1830, as well as at present, any of the four carriages, namely, the Chapman, Tredgold, the Quincy and Allen, could be run with high velocities, such as have been practised since 1830.

In the drawings and descriptions there is no allusion to the velocities at which those cars might be run.

To the thirty-fifth cross-interrogatory, he saith :

*Thirty-fifth X.* Carrying a great weight and dividing it equally on eight wheels, in order not to place a greater load on each wheel than they and the rails could well bear, is not the sole purpose of the employment of eight wheels in a car or carriage, as shown and expressed in the drawings and descriptions aforesaid.

In the Chapman carriage, with eight wheels, described on page 139, Repertory of Arts, Vol. 24, Second series, it is stated as follows : "And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equably upon both), and then, similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway." In the drawing, Plate V, Fig. 8, of the same volume, it is clearly manifest that the trucks are intended to swivel on the central king-bolt, and adapt themselves to the curve of the railroad.

The Tredgold carriage, described on page 94 of his treatise—I refer to the description of his eight-wheel carriage :—"When a carriage has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels. In the case where eight

wheels are applied to support one body, if the body rests upon the wheel frame, of each set of four wheels, in the middle of its length, (see fig. 26, Plate IV,) and is connected with those frames so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure."

The diagram, Fig. 26, Plate IV, of the same treatise, taken in connection with the description thereof on page 179, clearly manifests that the car bodies swivel around their respective king-bolts, or central pivots, and thus adapt themselves to the curves of the railroad. Whilst the models of the Quincy car and Allen locomotive clearly manifest the same purpose as will that referred to in the interrogatory; which latter purpose, however, they would all accomplish in different degrees.

To the thirty-sixth cross-interrogatory, he saith:

*Thirty-sixth X.* So far as my knowledge extends, I cannot say where or when such eight-wheel cars or carriages, to wit, those of Chapman, Tredgold, the Quincy car and the Allen Steam Carriage, were first employed, or for what purposes they were used prior to 1830. I speak of my own knowledge, and not from what I have heard or read.

To the thirty-seventh cross-interrogatory, he saith:

*Thirty-seventh X.* I have not been employed by any person or persons, corporation or corporations, to assist in the preparation of the defence of this case, or to collect evidence to impeach the validity of the patent of Ross Winans, in controversy in this suit; and I am not in any way connected with this case, excepting as a witness summoned to testify under the present commission, or interested in any way in the result of this controversy.

To the thirty-eighth cross-interrogatory, he saith:

*Thirty-eighth X.* I am not connected in any way with any railroad company.

To the thirty-ninth cross-interrogatory, he saith:

*Thirty-ninth X.* If the specification of Ross Winans's patent now in controversy, be intended to claim the invention of two four-wheel bearing carriages or trucks, composed of a rigid frame holding the axles parallel to each other, and at a distance from axle to axle in each truck, equal or nearly equal to the gauge of the truck, and supporting a car body, being placed at or near each end thereof, in such manner that the body may project beyond the trucks, and the swiveling of said trucks around a central king-bolt or other equivalent contrivance, and whether the car body be long or short, and whether the draft be from the truck or the body,—in my opinion his letters patent are clearly invalid for want both of novelty and originality.

If his patent claims the approximation of the wheels of each truck, so close together as barely to escape the contact of their flanges, and the connection of the journal boxes by means of a long leaf spring with the longer leaf down, and the attachment of a bolster to the middle of the spring on each side of the truck,—it may be, for all I know to the contrary, novel and original.

I never formed an opinion upon this subject before I examined the letters patent of said Winans, and compared the alleged invention therein described with the previously existing cars or carriages, or descriptions inquired about in the direct interrogatories.



Some years since I casually heard when travelling, (I do not know who was the informant,) that Ross Winans claimed to be the first who had ever contrived an eight-wheel car of any description, at which I expressed some surprise, inasmuch as I was aware of a number of previously invented eight-wheel cars. I do not, however, remember, that at the time I expressed any opinion as to originality or novelty of his patent. With this exception, I do not remember to have conversed with any person upon the subject of his patent, before the examination and comparison inquired of.

To the fortieth cross-interrogatory, he saith :

*Fortieth X.* I have not stated that I am a railroad superintendent. I am not a member of any association thereof ; nor am I a member of any committee thereof ; neither have I instructed, nor aided, nor consulted with the counsel or solicitor for the defendants, in the preparation of the defence.

To the forty-first cross-interrogatory, he saith :

*Forty-first X.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, or any of them, except through the Commissioners.

To the first further interrogatory, on the part of the Respondents, he saith :

*First.* I know no facts or circumstances tending to show that the eight-wheel cars, now in common use on railroads, were used with the knowledge of said Winans, unless an inference might be made from the fact, that such cars have, for a long period, been in general use, without hindrance on his part, so far as I am aware.

To the second further interrogatory, he saith :

*Second.* In my opinion it would not introduce any new mechanical principle or any new mode of operation, into the Chapman, Tredgold, Allen, or the Quincy cars or carriages, if, instead of the bodies or platform now shown or described, you should substitute longer bodies, retaining the same trucks or bearing carriages, and placing them under the body thus substituted, at the same distance from the respective ends thereof.

To the third further interrogatory, he saith :

*Third.* It would not, in my opinion, require invention to make that substitution.

To the fourth further interrogatory, he saith :

*Fourth.* There is nothing in the descriptions or drawings of the said Tredgold car or carriage, which renders it essential that all the wheels shall be equidistant from each other ; and if two trucks are placed remotely from each other, under one body, by the substitution of a longer body, there is nothing in such remoteness of the trucks from each other inconsistent or incompatible with the said description or drawings, or with the objects and purposes set forth by said Tredgold, in his said treatise.

To the fifth further interrogatory, he saith :

*Fifth.* I answer this interrogatory as I did the last, reference being had to the Chapman car or carriage, and the Chapman patent.

To the sixth further interrogatory, he saith :

*Sixth.* I answer this interrogatory as I have answered the fourth further interrogatory, relation being had to the Allen steam carriage.



To the seventh further interrogatory, he saith :

*Seventh.* There is nothing in the said Quincy car (judging by the model thereof, and what I know of its structure and uses, and mode of operation) which renders it essential that all the wheels thereof should be equidistant from each other, under one body; and the change of a longer instead of a shorter body (so that the same trucks should be coupled by the body remotely from each other, while the body should be supported at or near the two ends) would in nowise be inconsistent or incompatible with the objects and purposes for which the Quincy car is designed and used.

To the eighth further interrogatory, he saith :

*Eighth.* There is a difference, and it is essential, between the two mechanical theories. The mechanical theory of Winans is that great freedom of motion should be given to the wheels, and to the connection thereof with the body.

The mechanical theory on which the running gear of the eight-wheel cars now in common use, is arranged and connected with the body, is, that there should be a limitation of such motion, and such difference is essential.

To the ninth further interrogatory, he saith :

*Ninth.* The employment of long bodies is not necessary, according to the specification of Winans, in order to accomplish the purpose claimed and stated by him. In his specification, page 5 : 16, 17, and 18th lines from the bottom of the page, Winans states, speaking of the relief from lateral vibrations and concussions, "This relief is not materially varied by increasing or diminishing the length of the body, while the extreme ends of it continue to rest," &c.

To the tenth further interrogatory, he saith :

*Tenth.* I have answered that such greatest possible freedom of swiveling is not essential, and I refer to my answer to the thirty-third cross-interrogatory.

To the first further cross-interrogatory, he saith :

*First X.* If you will take the specification of Winans's patent, beginning at the words, "The passenger and other cars," on the sixteenth line of the third page, down to the words "Common road waggon," terminating the sentence on the fourth line of page 5, you will find the theory and application of the Plaintiff's invention.

I consider the Plaintiff's theory to be that, while allowing greater freedom of motion to the trucks, he couples the wheels of each bearing carriage close together, by substituting for a rigid wheel frame, which preserves the parallelism of the axles, a spring, connecting the journals of the axles together, and extending from the middle of each spring a bolster, through which passes a king-bolt, connecting the bearing carriage with the car body, in the manner of a common road waggon.

To the second further cross-interrogatory, he saith :

*Second X.* The average rate of speed upon railways, prior to 1830, could not be given without a knowledge of the speed attained upon each road. The usual rate of speed, upon a great majority of the railways, was from two and a half to eight miles an hour. There were some railways on which the rates varied from ten to nearly thirty miles per hour; such were the Liverpool and Manchester, and the Stockton and Darlington, in England.

Railways were principally used, prior to 1830, for the conveyance of minerals, metals, lime, wood, salt, &c. They were sometimes used for the transportation of other merchandize, and passengers.

To the third further cross-interrogatory, he saith :

*Third X.* The rails of roads constructed in 1830, were generally lighter than those now in use, and, of course, distribution rather than concentration of the weight of the cars and locomotives was required, which distribution is even now, notwithstanding the greater strength of roads, absolutely essential.

To the fourth further cross-interrogatory, he saith :

*Fourth X.* I recall only one railway in England, upon which, prior to 1830, passengers were habitually carried ; I refer to the Stockton and Darlington. If workmen, minors, and such persons can be considered as passengers, their transportation was habitual. But I cannot further answer the interrogatory, of my own knowledge.

To the fifth further cross-interrogatory, he saith :

*Fifth X.* Railways, prior to 1830, were habitually in the course of their regular business for the transportation of trains of merchandize, worked by horse power, although there were a number of roads upon which locomotives were used.

To the sixth further cross-interrogatory, he saith :

*Sixth X.* I have already answered this question in the second further cross-interrogatory, to which I now refer.

To the seventh further cross-interrogatory, he saith :

*Seventh X.* If the question refers to designing railroad cars for any particular road, I must answer in the negative. I have, however, for my amusement, and for the purpose of promoting improvements upon railways, designed and sketched sundry diagrams and drawings of cars of different descriptions, from those with two wheels, arranged on a single rail, to cars with eight and sixteen wheels, as long ago as 1825, when I was engaged in writing and publishing a number of essays on railroads, in pamphlet form, and in the newspaper press. There was no publication by engravings, that I remember, of these cars, but they were freely shown to all such whom I could induce to take any interest in the subject. The principles of some of those cars were not considered by me to be new at that time, although they were substantially the same as those of the eight-wheel cars now in common use.

GEO. W. SMITH.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Com's.*

## DEPOSITION OF WILLIAM PETTIT.

NOVEMBER 19, 1853. William Pettit, being duly sworn on the part of Respondents, saith in answer to the first interrogatory :

*First.* My name is William Pettit, my place of business and residence is in Philadelphia, by profession or occupation a machinist.

To the second interrogatory, he says :

*Second.* I served my time to the business of steam engine and locomotive building, and have followed that business for about twenty-two

years, and have by this means become practically acquainted with the mechanical principles of machinery in general. During all that time, until within the last seven or eight years, I was engaged in putting up and attending to railroad machinery, as connected with locomotive engines.

To the third interrogatory, he saith :

*Third.* I am familiar with the mechanical principles of the construction and operation of double-truck eight-wheel railroad cars, used by the Eastern Railroad Company, and those now in general use on the railroads of the United States.

To the fourth interrogatory, he saith :

*Fourth.* I have examined the specification of the letters patent, issued to Ross Winans, dated October 1, 1834, a copy of which is annexed to said commission.

To the fifth interrogatory, he saith :

*Fifth.* I have examined the model now shown to me, marked B, and identified with my signature ; it is a true representation of the car described and recommended in said specification. It does not, in any respect, differ therefrom.

To the sixth interrogatory, he saith :

*Sixth.* The essential characteristics of construction and arrangement of the double-truck eight-wheel car, now used by the Eastern Railroad, and in common use upon the railroads of the United States, in order to enable them to run smoothly, evenly, and safely over the curves, straight track and irregularities of railroads, are, a rigid truck frame, with pedestals and springs to hold the boxes for the shafts to run in, to keep them parallel. There should be two trucks under one body, with a bolster and king-bolt for the truck to swivel on without coming in contact. These trucks should be placed at a sufficient distance from the end to prevent accident to the trucks from collision : they should be placed from 5 to 7 feet from the end of the platform. The centres of the axles should be at least the distance of the breadth or gauge of the track. Each truck should have four wheels, well braced, to keep them square. These I regard as the essential and elemental features in the construction, organization, and arrangement of the double-truck eight-wheel car.

To the seventh interrogatory, he saith :

*Seventh.* The eight-wheel double-truck railroad cars now in general use upon the Eastern Railroad, and upon the roads of this country, have improvements or inventions applied to them not described in said specification. They have breaks, changing backs to the seats ; some have India rubber springs, swinging bolsters, patent lubricating boxes ; some have safety beams in the truck frame, to hold it up in case the axle breaks. These are all of the improvements that I can now remember, and none of these are described in Winans's specification.

To the eighth interrogatory, he saith :

*Eighth.* Bodies of the eight-wheel cars now in common use are so constructed that they can be removed from the trucks whenever desired, by taking out the king-bolts. The bolster of the truck is usually placed about seven feet from the end of the framing of the body.

To the ninth interrogatory, he saith :

*Ninth.* Some of said cars have side bearings to keep the body from rolling when the car is in motion.



To the tenth interrogatory, he saith :

*Tenth.* Check chains are in use—a very common thing. They are used to prevent the truck from turning round when it runs off the track, to keep it square with the track, or from slipping under the body.

To the eleventh interrogatory, he saith :

*Eleventh.* Increasing or diminishing the length of the body of the said eight-wheel car, while the trucks are placed at the same distance from the ends of the body, does not introduce any new or different mechanical principles into the organization of the car, nor does such change require any exercise of invention.

To the twelfth interrogatory, he saith :

*Twelfth.* In my opinion, connecting the axles of the wheels of the passenger car by long springs, as described in said specification, would be unsafe and impracticable for a passenger car.

To the thirteenth interrogatory, he saith :

*Thirteenth.* The drawing of the railroad freight car, annexed to the commission, which I have examined, does not show a car, constructed with running gear, in the manner particularly described and recommended in said specification. Winans claims a strong spring with the boxes fastened to the ends of the spring; the drawing shows the boxes fastened to the centre of the spring, with the breaks in between the wheels, which is not described or claimed in Winans's specification. The specification recommends one spring on each side of the truck, while the drawing shows two. The centre piece of the truck on which the car rests, has a hole or pocket for the centre pin to rest in, XY, and this is placed about seven feet from the end of the car, while the specification says at or near the end of the car. The pocket Y, and pivot X, are not described in the specification. The drawing describes a rigid wheel frame for the trucks. In the specification no rigid wheel frame is described. The axles of the wheels were connected by a steel spring bolted to the top of the boxes of the axles. The drawing shows the short leaves of the springs downwards, while the specification is the reverse. The specification requires the wheels to be placed close together, while the drawing shows them far enough apart for brakes to be set between them, and the brakes are shown. The drawing shows a mode of coupling the cars, by means of a bolt, while none is described in the specification. The springs, in the drawing, are fastened to the underside of the frame, the ends of which spring work in cast iron pockets. This mode is different from that described in the specification, viz., bolting the ends of the spring on to the boxes of the axles. These are all the differences which I now, from an examination of the drawing and specification, am able to point out.

To the fourteenth interrogatory, he saith :

*Fourteenth.* I have examined the Repertory of Arts, Manufactures and Agriculture, vol. 24, second series, published in London, A. D. 1814, more particularly that part inquired of.

To the fifteenth interrogatory, he saith :

*Fifteenth.* I have examined the model K, and identified it with my signature; said model truly and correctly represents a railroad car or carriage, described in said book and drawings. It could be changed into a six-wheel car, by following the direction of the specification.



To the sixteenth interrogatory, he saith :

*Sixteenth.* A car builder of ordinary skill and knowledge of his profession, would be able, by aid of said specifications and drawings, and without the necessity of exercising his own invention, to construct eight-wheel railroad cars, substantially the same as those now used by the Eastern Railroad and other railroads generally, so far as respects the manner of arranging and connecting the eight-wheels, and the connection of the trucks with the body of the cars.

To the seventeenth interrogatory, he saith :

*Seventeenth.* Chapman's car, as shown in said book and drawings, has side bearings, centre pivot, and rigid rectangular wheel frames.

To the eighteenth interrogatory, he saith :

*Eighteenth.* The distance between the bearing point of the wheels, is about equal to the width of the track. I have measured the same.

To the nineteenth interrogatory, he saith :

*Nineteenth.* Model K, now before me, may be made to represent both the six and eight wheel carriage.

To the twentieth interrogatory, he saith :

*Twentieth.* I have examined a work, called "A Practical Treatise on Railroads and Carriages," by Thomas Tredgold, published in London, 1825, and the drawings therein referred to. In said book I find a description and drawings of a double-truck eight-wheel car.

To the twenty-first interrogatory, he saith :

*Twenty-first.* The car is a long body, with two four-wheel trucks, each truck having four wheels united by a rigid wheel frame, the centre of said truck being united to the body by a king-bolt, which will allow the truck to swivel freely, and turn to the curves and inequalities of the road. The trucks do not interfere with each other; and the ends of the body project beyond the ends of the truck. The bearing points of the wheels from each other are about equal to the gauge of the track. The car there shown is calculated to distribute weight equally upon all the wheels, and to pass freely over the curves and inequalities of the road.

To the twenty-second interrogatory, he saith :

*Twenty-second.* I have examined model A. It is a correct representation of said eight-wheel car of Tredgold. It differs therefrom in no respect, so far as I can see. I have examined model C; it is not a correct representation of the car described by Tredgold, or of any car described by him, that I know of. It has not the centre pin or king-bolt to swivel on, as shown in A: it has a cross axletree running through the side piece; the wheel frames are stationary, and would not turn between the rails when obstacles are thrown in its course. Car A has a coupling link at the end of the body, the draft being from the middle to the end of the body, and is shown in Tredgold; model C does not show any such arrangement.

To the twenty-third interrogatory, he saith :

*Twenty-third.* I have compared the eight-wheel car of said Tredgold, with the eight-wheel cars used by the Eastern Railroad, and in general use in this country. So far as regards the running gear, they are, in their mechanical principles and mode of operation, substantially identical.

To the twenty-fourth interrogatory, he saith :

*Twenty-fourth.* The said Tredgold car, as described and shown in the drawings, is calculated to answer the purposes and objects set forth in said Winans's specification, as designed to be accomplished by him.

To the twenty-fifth interrogatory, he saith :

*Twenty-fifth.* I have seen a copy of the letters patent of the United States granted to Jonas P. Fairlamb, and of the drawings and specifications attached thereto. There is no part of the invention described or claimed in said Winans's patent, described or shown in said Fairlamb's patent or drawings, so far as I can see. In fig. 2, of said drawings, the wheels in the truck are coupled near each other, and the remoteness of the trucks from each other is the only thing I can see at all resembling Winans's specifications.

To the twenty-sixth interrogatory, he saith :

*Twenty-sixth.* I think that a mechanic of ordinary skill in car building, having knowledge of said Fairlamb's patent and drawings, would be enabled, without exercising invention, to construct eight-wheel double-truck cars, substantially like those used by the Eastern Railroad, or like those now in common use on the roads of the United States ; and if so constructed, they would, in my opinion, embody the essential principles of the eight-wheel railroad car in common use. They would attain the beneficial results pretended to be obtained by said Winans in his patent.

To the twenty-seventh interrogatory, he saith :

*Twenty-seventh.* I have examined the model of the Allen steam carriage, marked "Horatio Allen," now shown to me by the Commissioners, and identified it with my signature. The drawings, G and H, are not now shown me. The carriage is borne by two trucks ; each truck has four wheels in a rigid wheel frame. The truck-frame is united to the axles of the wheels, by means of springs and pedestals, upon the same principle as is shown in model K, which prevents the axes from losing their parallelism. Each truck has a bolster running across the centre, from side to side, the bolster being connected with the side frames of the truck. The body of the carriage rests upon the upper bolster, by means of a pivot or centre-pin, enabling the truck to swivel readily to the curves and inequalities of the road. The friction rollers, as shown in the model, operate as side bearings to keep the body of the carriage from rocking. The ends of the truck frames projected beyond the body of the car. A part of the body of the carriage hung down between two trucks. If the steam apparatus was taken off, it would leave the bolsters and all other parts as they were, and a passenger car might be constructed similar to the eight-wheel cars now in ordinary use, and will combine all the mechanical elements of the double-truck of the eight-wheel car, as well as their practical benefits. It would contain the construction and organization necessary to produce the beneficial results stated and claimed to be accomplished in Winans's specification of Oct. 1, 1834. The whole of the objects set out in Winans's patent is embodied in the Allen steam carriage. The carriage also shows friction rollers and rigid wheel frames, which are not shown or described in Winans's specification.

To the twenty-eighth interrogatory, he saith :

*Twenty-eighth.* I have examined the model of the eight-wheel double-truck railroad car now before me, marked "G. Bryant," and iden-

tified with my signature. It has a rigid truck frame, each truck having four wheels; wheel frames have side pieces and double cross bolsters; these bolster pieces have king-bolts, which pass through these and through the middle of the ends of the centre timber. Each bolster has what we term a transom plate and side bearings. The two trucks are one at each end of the bearing platform, swiveling upon king-bolts; the bearing points of the wheels are about equal to the gauge of the track. The trucks are sufficiently distant from each other to allow them to swivel without interfering. In operation, it is precisely the same in principle as the eight-wheel car now in common use. It is adapted to pass all the inequalities and curves as well as the straight track of the road. It is constructed and operated upon the same mechanical principles with the cars used by the Eastern Railroad, and with those now in general use on the railroads of the United States, and with the model of the Eastern Railroad car, now shown to me.

To the twenty-ninth interrogatory, he saith:

*Twenty-ninth.* There is not embodied in said car any part of the invention described by said Ross Winans. The Quincy car also shows the draft from the middle to the end of the truck.

To the thirtieth interrogatory, he saith:

*Thirtieth.* I think that a mechanic of ordinary skill and knowledge in building railroad cars, having knowledge of the said Quincy car, in 1829 or 30, would have been able, at that time, without the exercise of invention of his own, to construct double-truck eight-wheel railroad cars substantially like those now in general use, so far as regards the arrangement of the wheels and the connection of the trucks with the bodies of the cars.

To the thirty-first interrogatory, he saith:

*Thirty-first.* I have seen and examined the works referred to; the mode of drawing railroad cars by a coupling from the middle of the ends of the bodies, was well known and publicly used, prior to 1830, and is shown and described in said works.

To the thirty-second interrogatory, he saith:

*Thirty-second.* I have examined the last mentioned printed works; the distance of the bearing points of the wheels is about equal to the gauge of the track. The distance of the bearing points of the wheels, in the best constructed cars now in use in the United States, is about equal to the gauge of the track.

To the thirty-third interrogatory, he saith:

*Thirty-third.* Springs and pedestals, as now used on the eight-wheel double-truck cars, were applied to the four-wheel cars, described and shown in the American edition of Wood's Treatise, in 1832, and in said Allen's model.

To the thirty-fourth interrogatory, he saith:

*Thirty-fourth.* The mode of causing the wheels of railroad cars to revolve with the axles, was a well known equivalent for the mode of causing them to revolve on the axles, before the year 1830; and is shown in Wood's treatise on railroads, of 1825, and Tredgold's treatise of 1825; also in Strickland's report on canals, &c., published in 1826.

To the thirty-fifth interrogatory, he saith:

*Thirty-fifth.* It does not, in my opinion, involve any change in the



mechanical principles or modes of operation in said Quincy car, to substitute for the axletrees, axles revolving with the wheels; or larger wheels instead of those used, so as to cause the flanges of the wheels on each truck to approach very near each other; or to draw the said car by the body, instead of drawing it by the truck; or to increase the length of the body of the platform; or to place a box upon the top of said platform, so as to become a passenger car; or to cause it to run at a greater or less rate of speed. It would not, in my opinion, require invention to make any or all of these changes.

To the thirty-sixth interrogatory, he saith:

*Thirty-sixth.* In the construction and operation of the double truck eight wheel car, the distance of the flanges from each other, is not, *of itself considered*, material. The distance may be varied by placing wheels of larger diameter, without in any way changing the mechanical principles or mode of operation of the car containing them. The bearing points would still be the same.

To the thirty-seventh interrogatory, he saith:

*Thirty-seventh.* The distance of the bearing points upon the rails of the wheels in each truck, is material and essential to the operation of the cars; because it is through the bearing points that the rails direct the car in its course over the road.

To the thirty-eighth interrogatory, he saith:

*Thirty-eighth.* Maintaining the axles of the wheels in each truck at a fixed and uniform distance from each other, is material and essential in the construction and operation of the eight-wheel car. If the axles are brought too close together, they are more likely to gain in the curves of the road, or to be thrown off the track by a slight obstacle. They should be kept firm and square upon the track, at fixed distances, not less than the width of the track.

To the thirty-ninth interrogatory, he saith:

*Thirty-ninth.* I do not know any other fact or circumstance which, in my opinion, is pertinent to the issue and beneficial to the Defendant.

To the fortieth interrogatory, he saith:

*Fortieth.* In my opinion, the theory of the said Winans for constructing or arranging the eight-wheel car, is incorrect. The practical operation of railroad cars, constructed on Winans's plan, would create great friction as well upon the rails as upon the wheels. The wheels being placed close together, are liable to be thrown from the track upon any obstruction being presented, and to jam between the rails in striking the curves. I do not consider trucks constructed upon his plan, as safe either for passenger or any other car. I do not state these things from observation, but it is my opinion from reading his specification and examining his models.

CHAS. HEAZLITT,  
ROBERT P. KANE.

To the first cross-interrogatory, he saith:

*First X.* I have been engaged for twenty-two years in building locomotive engines, and during all that time have been engaged in the construction, arrangement, and examination of machinery pertaining to locomotives.

To the second cross-interrogatory, he saith:



*Second X.* I have been and am particularly conversant with the construction of the running apparatus of railroad cars or carriages. I have paid considerable attention thereto, in my capacity as foreman, in the locomotive engine factory of Mr. Baldwin, and for the period of time above referred to. I have paid attention to it, both in the mechanical construction of the running gear, and in the preparation of the drawings.

To the third cross-interrogatory, he saith :

*Third X.* I have never been examined as an expert, in courts of justice, in patent cases.

To the fourth cross-interrogatory, he saith :

*Fourth X.* I have been accustomed to the examination and comparison of machinery, with a view to forming an opinion as to the substantial identity between two or more machines or combinations of apparatus. I have made such examination and comparison, for the purpose of satisfying my own mind, and not with a view of expressing an opinion upon the identity of the several subjects. The subjects with which I am most conversant, are those connected with the locomotive engine, and the running gear attached. We use a truck under our engines, precisely similar to those now in general use on the eight-wheel car.

To the fifth cross-interrogatory, he saith :

*Fifth X.* I am a foreman in Mr. Baldwin's shop, as before stated ; as such it has been a part of my duty and employment, to attend to the construction and arrangement of the running gear of railroad cars or carriages.

To the sixth cross-interrogatory, he saith :

*Sixth X.* I am theoretically acquainted with railroad engineering. I fully understand the principles involved in the construction and operation of railroad cars of various kinds, and the properties essential to their proper operation, under the present condition of railroad construction and engineering. I have such a knowledge of the subject, as will enable me to compare the different construction of cars, and to judge therefrom whether they are practically adapted to answer the purposes required of railroad cars, under the conditions of high rates of speed, steadiness of movement, and the curvature and irregularities of the road, commonly found in the working of railroads in this country.

To the seventh cross-interrogatory, he saith :

*Seventh.* It is my opinion that it is important and essential to the proper operation of an eight-wheel car, that it should be able to move round curves in the road with the least practicable friction between the flanges of the wheels and the rails.

To the eighth cross-interrogatory, he saith :

*Eighth X.* I think the friction between the flanges of the wheels and the rails will be proportionate to the resistance which the wheels offer to the guidance of the rail.

To the ninth cross-interrogatory, he saith :

*Ninth X.* The wheels of a four-wheel car, or of the truck of an eight-wheel car, will not run upon a curve with less friction between the flanges and the rails, the nearer the axles of the wheels are to each other. Such a proximity would allow the wheels to get too oblique to

the rails, and would cause greater friction, and be liable to throw the car from the track :

To the tenth cross-interrogatory, he saith :

*Tenth X.* The wheels of the trucks of an eight-wheel car will not, independently from other considerations, run upon the curve and over the irregularities of the road, and yield to the guidance of the rails with the least friction, when the trucks have the greatest freedom of motion. There should not be greater freedom of motion than would allow the truck to run free. If they have too much freedom of motion, they are liable to jam or to become oblique to the rail.

To the eleventh cross-interrogatory, he saith :

*Eleventh X.* I am sufficiently acquainted, from personal knowledge and reading, with the state of railroad engineering at and before the date of said Winans's patent, and particularly prior to 1830, to compare the present advanced state of railroad engineering with what then existed. Prior to 1830 I assisted in making a working model of the steam engine "Novelty," then being run upon a railroad in England. This model was built for Mr. Peale, and was run by him in his exhibition in this city. In the year 1831, I worked upon the locomotive "Ironsides," then being built for the Norristown Railroad. I was engaged as engineer of the "Ironsides" for a short period after she was put upon the road. I was engaged by Mr. Baldwin, who built the engine, to run her, it being at that time an experiment. I have been engaged, as I have before stated, ever since, in the locomotive engine business.

To the twelfth cross-interrogatory, he saith :

*Twelfth X.* In my opinion it is important and essential to the running of cars at high speed, such as has been practised since the time of said Winans's invention, that they should be made in such a manner as to insure greater steadiness of motion than was attained by the four-wheel car. It is my opinion that making the car body of great length, as compared with the modes before practised, and supporting the same at or near its ends, are essential to the attainment of greater steadiness of motion at high velocities, than could be obtained by the four-wheel cars, as formerly constructed.

To the thirteenth cross-interrogatory, he saith :

*Thirteenth X.* It is, in my opinion, essential to the proper construction of an eight-wheel car, that it shall have the capacity to work with other cars in a long train, and in any part of the train in which it may be placed.

To the fourteenth cross-interrogatory, he saith :

*Fourteenth X.* It is important and essential to the proper working of a first car in a train, that while it is subjected to the whole draft of the train, its trucks shall have the same freedom of motion that any other trucks in the train have.

To the fifteenth cross-interrogatory, he saith :

*Fifteenth X.* It is essential, in order to give freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them.

To the sixteenth cross-interrogatory, he saith :

*Sixteenth X.* Model B truly represents the car described in the Plaintiff's patent, in the extent of bearing surface between the bolsters. The drawing attached to the commission is different from the model (B). The truck-frame in the drawing is placed from five to seven feet

from the end of the car frame, and is not described in the patent ; the bearing surfaces, therefore, are different ; the wheels are placed farther apart ; and altogether the arrangement of the bearing surfaces is different.

To the seventeenth cross-interrogatory, he saith :

*Seventeenth X.* Model B does not show the mode of attaching the draft, as is represented in the drawing of the Plaintiff's patent, nor is any mode of draft described in his specification.

To the eighteenth cross-interrogatory, he saith :

*Eighteenth X.* The Complainant describes, in his specification, as an essential part of his invention, two large springs, with long leaves downwards, and the ends bolted on to the boxes ; a bolster, extending across between the middle of the springs, forms the truck or bearing carriage, the wheels being placed as closely as possibly together, so as not to admit of the flanges touching.

To the nineteenth cross-interrogatory, he saith :

*Nineteenth X.* I consider the use of springs essential to the proper construction of an eight-wheel car.

To the twentieth cross-interrogatory, he saith :

*Twentieth X.* The description and drawings of the Chapman engine inquired of, represent a railroad car, like model K. I quote from page 139, Repertory of Arts, vol. 24: "Fig. VIII shows a carriage of six wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels are, as usual on railways, fixed to the body of the carriage ; 2, 2, and 3, 3, the other two pair, are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised as that two-thirds of its weight should lie over the central point of the four wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two-thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates C, C, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal wagon ; and if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equably upon both), and then similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway." [The drawing to which I refer faces page 130, and is Fig. VIII.] The draft is from the middle of the end of the body, as shown in Fig. I.

To the twenty-first cross-interrogatory, he saith :

*Twenty-first X.* The drawing, Fig. 1, plate I, following page 184 of Tredgold's book, shows the mode of coupling, as exhibited in model A. This mode of coupling is shown in four-wheel cars, and could be well adapted without exercising any invention, to the eight-wheel car.

To the twenty-second cross-interrogatory, he saith :

*Twenty-second X.* On Plate 4, Fig. 26, is shown the vertical king-bolt, for the wheel frame or truck to swivel, as it runs on the road. On page 94, I read, "When a carriage has more than four wheels the body must be sustained so that its pressure may be divided equally among the wheels. In the case where eight wheels are applied to support one



body, if the body rests upon the wheel frame of each set of four wheels, in the middle of its length [see Fig. 26, plate 4], and is connected with those frames, so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure." At page 179, "The body of the waggon rests on the wheel frames at A A, and is connected to them by an axis, on which the frames turn, when, from any inequality, the axes of the wheels are not in the same plane."

To the twenty-third cross-interrogatory, he saith :

*Twenty-third X.* I understand Winans's invention to be the large springs and bolster at or near the end of the body, the wheels in each carriage being placed as nearly as possible together, without coming in contact at the flanges. I do not find this construction in the Allen carriage, which, in principle, is like the eight-wheel cars now in general use. I find the following language in Winans's specification : "The wheels I connect together, by means of a very strong spring, say double the usual strength employed for ordinary cars, the ends of which spring are bolted or otherwise secured to the upper side of the boxes which rest on the journals of the axles." "Having thus connected two pairs of wheels together, I unite them into a four-wheel bearing carriage, by means of their axles and a bolster of proper length, extending across between two pairs of wheels, from a centre of one spring to that of the other, and securely fastened to the tops of them." "Upon this first bolster I place another of equal strength, and connect the two together by a centre-pin or bolt passing down through them, and thus allowing them to swivel or turn upon each other, in the manner of the front bolster of a common road waggon.

To the twenty-fourth cross-interrogatory, he saith :

*Twenty-fourth X.* The Quincy car shows a king-bolt, on which the centre turns, allowing the truck to swivel laterally to the road. The description which I have given, in the last cross-interrogatory, of Winans's specification, applies also to this.

To the twenty-fifth cross-interrogatory, he saith :

*Twenty-fifth X.* A mechanic of ordinary skill, having all the knowledge possessed by the world in 1829 and 1830, about the construction of cars, would have known what the requirements and characteristics of a railroad passenger car must have been, to enable it to move safely and smoothly over the curves and irregularities of a railroad, as then or now constructed, at a rate of thirty miles per hour, and to perform the duties required of the ordinary eight-wheel cars now in use. He would have derived his knowledge from the treatises of Wood and Tredgold, and from the description of the Chapman patent, contained in Vol. 24, second series, of the Repertory of Arts, &c., already referred to.

To the twenty-sixth cross-interrogatory, he saith :

*Twenty-sixth X.* I consider the arrangement of railroad car wheels fixed firmly to their axles, and rotating with them, to be the same in principle as those rotating loosely upon fixed axles.

To the twenty-seventh cross-interrogatory, he saith :

*Twenty-seventh X.* The draft in the Quincy car was applied to the middle of the forward part of the truck. I would remark, that I judge only from the model of the Quincy car that has been exhibited to me.

To the twenty-eighth cross-interrogatory, he saith :

*Twenty-eighth X.* I cannot see any difference in the application of



the draft to the truck, or to the body of the car. The principle in both cases is the same.

To the twenty-ninth cross-interrogatory, he saith :

*Twenty-ninth X.* The cars described in the works of Wood, Tredgold, and Strickland, referred to in the thirty-first interrogatory, as having the draft applied to the middle of the ends of the body, were four-wheel cars. The wheels were attached to the bodies of such cars.

To the thirtieth cross-interrogatory, he saith :

*Thirtieth X.* In every instance that has come to my knowledge as existing prior to the invention of the Complainant, in which eight wheels were employed, arranged in bearing carriages or trucks to sustain an independent body, the draft has been represented as applied to the truck instead of the body, when any mode of applying the draft has been shown.

To the thirty-first cross-interrogatory, he saith :

*Thirty-first X.* The drawings or description of the "Chapman engine," referred to in the fourteenth direct interrogatory, or the drawings or description in Tredgold's treatise, referred to in the twentieth direct interrogatory, or the drawings or model of the Allen locomotive, referred to in the twenty-seventh direct interrogatory, or the model of the Quincy car, or all of them, would not teach a mechanic of ordinary skill and knowledge in the construction of cars, in the year 1830, that placing the wheels of the trucks very near together would reduce the friction between the flanges of the wheels and the rails over curves. I would add that, in my opinion, the placing of the wheels of the trucks very near together would increase the friction referred to.

To the thirty-second cross-interrogatory, he saith :

*Thirty-second X.* The same drawings and descriptions would have taught such a mechanic, in the year 1830, that great stability of motion when running at high velocities, could be attained by constructing the car body of great length, and supporting it at or near each end, upon two trucks thus constructed. On page 94 of Tredgold's treatise, I find this language : "Small carriages must obviously be both heavier and more expensive, in proportion, than large ones. But as the stress on a wheel must be limited on a railroad, we cannot much enlarge the carriages without adding to the number of wheels.

"When a carriage has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels." I would also refer to plate 4, figure 26, and the description of such plate at the top of page 179; a plate attached to the Tredgold treatise, and referred to in the body of that work, at page 94. My answer to this interrogatory, is founded upon these extracts.

To the thirty-third cross-interrogatory, he saith :

*Thirty-third X.* The same drawings and descriptions would not have taught a mechanic, in 1830, that in order to move over the curves and irregularities of a railroad at a high velocity, with safety and stability of motion, and with the least practicable friction on the rails, that the trucks should have the greatest possible freedom to conform to the surface of the rails, and should not be constrained by the draft.

To the thirty-fourth cross-interrogatory, he saith :

*Thirty-fourth X.* In the drawings and descriptions aforesaid, there is a description of, or allusion to, arrangements or modifications in the

construction of railroad cars, by which they might be run at high velocities, such as have been practised since 1830.

To the thirty-fifth cross-interrogatory, he saith :

*Thirty-fifth X.* The purpose shown and expressed in the drawings and descriptions before referred to, of the employment of eight wheels in a car or carriage, is solely that of carrying great weights, and dividing the weight equally on eight wheels, in order not to place a greater load on each wheel than they and the rails could well bear.

To the thirty-sixth cross-interrogatory, he saith :

*Thirty-sixth X.* So far as my knowledge extends, such eight-wheel cars or carriages were not employed previous to the year 1830, except to carry weights that could not be subdivided and carried upon four-wheel cars.

To the thirty-seventh cross-interrogatory, he saith :

*Thirty-seventh X.* I have not been employed, by any person or persons, corporation or corporations, to assist in the preparation of the defence of this case; or to collect evidence to impeach the validity of the patent of Ross Winans, in controversy in this suit. I am not in any way connected with this case, except as a witness, summoned to testify under the present commission; and I am not interested in any way in the result of this controversy.

To the thirty-eighth cross-interrogatory, he saith :

*Thirty-eighth X.* I am not connected in any way with any railroad company.

To the thirty-ninth cross-interrogatory, he saith :

*Thirty-ninth X.* I have formed an opinion that the letters patent of Ross Winans, now in controversy in this case, are invalid, both for want of novelty and originality. I did not form such an opinion upon the subject before I examined the letters patent of said Winans, and compared the alleged invention therein described, with the previously existing cars or carriages or descriptions inquired about in the direct interrogatories, but after such an examination and comparison. I do not recollect conversing with any person upon the subject of the novelty or originality of the said alleged invention of Ross Winans, before I made an examination of the letters patent and the comparison inquired of.

To the fortieth cross-interrogatory, he saith :

*Fortieth X.* I have before answered, that I am not connected in any way with any railroad. I am not a member of any association of railroad superintendents, and I have not instructed or aided, or consulted with the counsel or solicitor for the Defendants, in the preparation of the defence of this suit.

To the forty-first cross-interrogatory, he saith :

*Forty-first X.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, or any of them, save by the Commissioners.

*Answers to Further Interrogatories to be addressed on the part of the Respondent, &c.*

To the first further interrogatory, he saith :

*First.* I do not know any fact or circumstance tending to show that the eight-wheel car, now in common use on railroads, was used with

the knowledge of said Winans, and without objection or claim thereto on his part. The eight-wheel car, however, I would add, is in common use throughout the country, and I should suppose that Mr. Ross Winans or any other engine builder would have knowledge of that fact.

To the second further interrogatory, he saith :

*Second.* In my opinion it would not introduce any new mechanical principle, or any new mode of operation into the Chapman, Tredgold, Allen, or Quincy cars or carriages, if (instead of the bodies or platforms now shown or described) longer bodies should be substituted, retaining the same trucks or bearing carriages, and placing them under the body thus substituted, at the same distance from the respective ends thereof.

To the third further interrogatory, he saith :

*Third.* It would not, in my opinion, require invention to make that substitution.

To the fourth further interrogatory, he saith :

*Fourth.* There is nothing in the descriptions or drawings, of the said Tredgold car or carriage, which renders it essential that all the wheels shall be equidistant from each other; and if two trucks are placed remotely from each other under one body, by the substitution of a longer body, there is nothing in such remoteness of the trucks from each other, inconsistent or incompatible with the said description or drawings; or with the objects and purposes set forth by said Tredgold, in his said treatise.

To the fifth further interrogatory, he saith :

*Fifth.* I would answer the same question in relation to the Chapman car or carriage, and the Chapman patent, as I have answered to the same question, relation being had to the Tredgold car or carriage.

To the sixth further interrogatory, he saith :

*Sixth.* I answer this interrogatory, substituting the Allen car or carriage for the Tredgold, as I have answered to the fourth interrogatory.

To the seventh cross [?] interrogatory, he saith :

*Seventh.* There is nothing in the said Quincy car which renders it essential that all the wheels thereof should be equidistant from each other under one body. The change of a longer instead of a shorter body, (so that the same trucks should be coupled by the body remotely from each other, while the body should be supported at or near the two ends,) would not be in any wise inconsistent or incompatible with the objects and purposes for which the Quincy car is designed and used.

To the eighth further interrogatory, he saith :

*Eighth.* In my opinion there is a difference between the mechanical theory, according to which said Winans, in said specification, recommends and claims the arrangement of wheels, and the connection thereof with the body; and that mechanical theory on which the running gear of the eight-wheel car now in common use is arranged and connected with the body; and such difference is, in my opinion, essential.

To the ninth further interrogatory, he saith :

*Ninth.* It is not necessary, according to the specification of said Winans, in order to accomplish purposes claimed and stated by him, to use or employ very long bodies.

To the tenth further interrogatory, he saith :

*Tenth.* It is not essential to the proper and safe construction of eight-wheel cars, for rapid travelling, that the trucks should have the greatest possible freedom of swiveling, to conform to the surface of the rails. This freedom of swiveling should be limited so that the trucks may conform to the line of motion. This freedom of swiveling is limited by the flanges of the wheels, in their contact at the bearing points with the rail.

*Answers to Plaintiff's Cross-interrogatories in addition, &c.*

To the first additional cross-interrogatory, he saith :

*First X.* The theory of the Plaintiff, referred to in my answer to the eighth additional interrogatory, is, that of placing the axles of his bearing carriages as near together as possible, thus causing them to approach more nearly to the direction of the radii of the curves, in order to avoid the lateral friction from the rubbing of the flanges against the rails, and so that the two wheels on either side of one of the bearing carriages may, from their proximity, be considered as acting like a single wheel. This is the only peculiar mechanical theory of the Plaintiff that I find.

To the second additional cross-interrogatory, he saith :

*Second X.* The average rate of speed upon railways, prior to 1830, was some eight miles an hour. Railways were principally used, prior to that date, for the transportation of freight.

To the third additional cross-interrogatory, he saith :

*Third X.* Railways were principally constructed, prior to 1830, of cast iron rails, of short lengths. They were constructed of such material, and in such way, that distribution rather than concentration of the weight of the cars and of the locomotive, was required.

To the fourth additional cross-interrogatory, he saith :

*Fourth X.* I cannot say whether there was more than one railway in England prior to 1830, upon which passengers were habitually carried.

To the fifth additional cross-interrogatory, he saith :

*Fifth X.* The use to which railways, prior to that time, were habitually put, in the course of their regular business, was the transportation of trains of merchandise by horse power.

To the sixth additional cross-interrogatory, he saith :

*Sixth X.* In mentioning the average speed of railways, in answer to the second additional cross-interrogatory, I had reference to steam power. The average speed, prior to 1830, of railways, was about four miles per hour.

To the seventh additional cross-interrogatory, he saith :

*Seventh X.* I have never designed railway cars.

WM. PETTIT.

CHAS. HEAZLITT.  
ROBERT P. KANE.



To the first interrogatory on the part of the Respondent, to Harman Yerkes and others, he saith :

*First.* I have before answered this interrogatory.

To the second interrogatory, he saith :

*Second.* I was in the employ of Mr. M. W. Baldwin, machinist, in the year 1833, and have continued so ever since. I never visited Durkee, Slaymaker & Co.'s office, and don't know where it was.

To the third interrogatory, he saith :

*Third.* I know nothing of the matters inquired of in this interrogatory.

To the fourth interrogatory, he saith :

*Fourth.* I know nothing of the matters inquired of in this interrogatory.

To the fifth interrogatory, he saith :

*Fifth.* I know nothing of the matters inquired of in this interrogatory.

To the sixth interrogatory, he saith :

*Sixth.* I know nothing of the matters inquired of in this interrogatory.

To the seventh interrogatory, he saith :

*Seventh.* I cannot describe the said model ; I never saw it.

To the eighth interrogatory, he saith :

*Eighth.* I know nothing of the matters inquired of in this interrogatory.

To the ninth interrogatory, he saith :

*Ninth.* I know nothing of the matters inquired of in this interrogatory.

To the tenth interrogatory, he saith :

*Tenth.* I know nothing of the matters inquired of in this interrogatory.

To the eleventh interrogatory, he saith :

*Eleventh.* I know nothing of the matters inquired of in this interrogatory.

To the twelfth interrogatory, he saith :

*Twelfth.* I know nothing of the matters inquired of in this interrogatory.

To the thirteenth interrogatory, he saith :

*Thirteenth.* I know nothing of the matters inquired of in this interrogatory.

To the fourteenth interrogatory, he saith :

*Fourteenth.* I know nothing of the matters inquired of in this interrogatory.

To the fifteenth interrogatory, he saith :

*Fifteenth.* I never saw said model, nor did I know one was made. And as I understand all the foregoing interrogatories to be predicated upon a supposed view of the model, I desire my answers not to be taken upon that supposition, as I never saw the model. I cannot say whether or not any car or cars were constructed upon its principle. If, however, the car Victory is referred to, and it is understood that my answers refer to said car, and not to a supposed model of said car—then I say, that I knew of said car Victory being placed on the Germantown or Norristown Railroad, not later than 1835. She was pur-

chased by the company; I don't know from whom; but I understood the name of the builder to be a man named Emley; he was about her a great deal. The principle of this car was in no way different from the eight-wheel cars now in ordinary use. The body of this car sunk in the centre between the trucks, while those in ordinary use are level. Cars similar in principle are now in use upon all the principal railroads of the country.

To the cross-interrogatory on the part of the Complainant, he saith :  
I have already answered this interrogatory, in my answer to the sixth direct interrogatory on the part of the Respondent.

WM. PETTIT.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Com'rs.*

### DEPOSITION OF JOHN MURPHY.

NOVEMBER 25, 1853. John Murphy, being duly sworn on the part of the Respondent, in answer to the first interrogatory, saith :

*First.* My name is John Murphy, age about forty-five years, residence in the county of Philadelphia, by profession or occupation a car-builder. I have been engaged in that business since 1833.

To the second interrogatory, he saith :

*Second.* I have built both four-wheel and eight-wheel passenger cars and freight cars. I am acquainted with the principle of construction and operation of the eight-wheel cars in general use on railroads.

To the third interrogatory, he saith :

*Third.* I am well acquainted with Ross Winans; have been for the last sixteen or eighteen years, and have been doing business with him for the last twelve years. Before that time I had business with him through his agents, Eastwick and Harrison and others. He has often been at the shop while eight-wheel cars were being built. I don't know whether he knew of my building such cars; but he must have known it, because I was using his wheels at the time. He did not at any time state that he had a patent for an eight-wheel car; and never, at any time, made any claim on me for constructing eight-wheel cars.

To the fourth interrogatory, he saith :

*Fourth.* I first learned, in or about the spring of 1851, from the public newspapers, that Winans claimed to have a patent for an eight-wheel car, and had sued a company for infringement. I don't know whether it was a decree in the suit, or an application for injunction.

To the fifth interrogatory, he saith :

*Fifth.* I first saw an eight-wheel car called the "Victory," on the Columbia Railroad, between the inclined plane and Broad street. I think this was on the third day of July, 1835. She run on there on the fourth of July upon that road, and perhaps a week or two afterwards. After that she was taken to the Norristown Railroad, and run upon that road for five or six years, I think. She answered the purpose for which she was designed. I never heard any complaints. I considered her a complete car.

To the sixth interrogatory, he saith :

*Sixth.* This car "Victory" was about thirty to thirty-five feet long. She had a sunk bottom between the trucks. There was a four-wheel

truck under each end. I think she pulled by the trucks, and if so, the bolster would not have been more than three feet from the end of the platform; but I am not certain that she pulled by the trucks. The wheels of the truck were much closer together than we build them now. There were long springs, placed crosswise, and fastened to the pivot plate. The pivot plate was Emley's patent, and the springs were attached to it. I think the coupling was at the middle of the end of the body, or it might be to the trucks.

To the seventh interrogatory, he saith :

*Seventh.* I think Mr. Emley designed or invented and built that car. I think she was brought out in 1835; she was built at Bush Hill, on the site now occupied by the Norris establishments. I don't know how long she was being built before she was placed on the road.

To the eighth interrogatory, he saith :

*Eighth.* She was used in trains when she went on "the Norristown Road. She was drawn by motive power on the Norristown Road; and by horse power on the Columbia Road. Other cars, with the same mechanical principles and mode of operation, were constructed. The running gear of the car was the same; the car body was the same, except that those built subsequently had not the sunken centre. *It was not long after this car came out* that every body was building cars on the same principle. Mr. Emley built one or two more. Mr. Durkee was connected with Mr. Emley, and I ironed some for him. A company in Wilmington got out some.

I can't say whether there were other cars put on the road the same year; they were put in hands at once, and were put on the roads as soon as finished. When it was shown that eight-wheel cars would answer the purpose, they took the place of the four-wheel cars as rapidly as they could be built. They were placed on the Norristown Road, on the State Road, on the Camden and Amboy Road, and all the principal roads leading from Philadelphia.

To the ninth interrogatory, he saith :

*Ninth.* I have seen and examined the "Repertory of Arts, Manufactures and Agriculture, Vol. 24, second series, published in London, A. D. 1814, more particularly that part of said volume which includes the specification, and drawings of the patent of William and E. W. Chapman.

To the tenth interrogatory, he saith :

*Tenth.* I have examined the model K, shown me by the Commissioner, and identified with my signature. Said model truly and correctly represents a railroad car and carriage, described and shown in said book and drawings.

To the eleventh interrogatory, he saith :

*Eleventh.* A car builder, of ordinary skill and knowledge of his profession, would be able, by aid of said specifications and drawings, and without the necessity of exercising his own invention, to construct eight-wheel railroad cars substantially the same as those now used by the Eastern Railroad and other railroads generally, so far as respects the manner of arranging and connecting the eight wheels, and the connection of the trucks with the body of the cars.

To the twelfth interrogatory, he saith :

*Twelfth.* The said Chapman car, as shown in said book and draw-

ings, has side bearings, centre pivot and rigid rectangular wheel-frames. I could build a truck right from that drawing, such as we build them now, except that we put on springs and pedestals.

To the thirteenth interrogatory, he says :

*Thirteenth.* I have measured the distance between the bearing points of the wheels and the gauge of the track. They are about equal.

To the fourteenth interrogatory, he saith :

*Fourteenth.* Model K now before me may be made to represent both the six and the eight-wheel carriage, merely by substituting two wheels for one four-wheel truck.

To the fifteenth interrogatory, he saith :

*Fifteenth.* I have examined a work called a Practical Treatise on Railroads and Carriages, by Thomas Tredgold, published in London, in 1825, and the drawings therein referred to ; and in said book I find a drawing and description of a double-truck eight-wheel railroad car.

To the sixteenth interrogatory, he saith :

*Sixteenth.* The eight-wheel car, as described, has the bolster ; the rigid rectangular wheel frame, to allow it to curve on the road ; the wheels are about the gauge of the track, or nearly so ; the drawing does not show a spring ; it shows the wheel frames bolted to the axles ; it has a beam from centre to centre of the wheels ; the pressure upon the trucks is equally divided among the wheels, and a car built according to this drawing will show all the mechanical principles of the ordinary eight-wheel car now in general use.

To the seventeenth interrogatory, he saith :

*Seventeenth.* I have examined the model marked A. It is a correct representation of said eight-wheel car of said Tredgold. It does not differ in any respect therefrom.

I have examined model C. It is not a correct representation of said eight-wheel car of said Tredgold, or of any car described by him.

These trucks are on solid beams ; the body and bolsters are permanent ; there is, therefore, no chance for them to swivel to the track or curve, unless the journals had about four inches play in the boxes ; they would run off the rail and climb the track ; the drawing shows a swiveling truck ; body is above the beams, while C is on the beams. This model and drawing are nothing alike ; model A is an exact representation ; I should n't think C was constructed to run on a railroad. It could n't run one hundred yards before it run off the track. The formation of the truck is similar to the drawing, but the mode of fastening is altogether wrong, in my estimation.

In answer to the eighteenth interrogatory, he saith :

*Eighteenth.* I have compared the eight-wheel car of said Tredgold with the eight-wheel cars used by the Eastern Railroad, and in general use in this country, so far as regards the running gear. They are, in my opinion, in their mechanical principles and mode of operation substantially identical.

In answer to the nineteenth interrogatory, he saith :

*Nineteenth.* The said car of Tredgold is calculated to conform to all the irregularities of railroads. It is also calculated to answer the purposes and objects set forth in said Winans's specification, as designed to be accomplished by him.

To the twentieth interrogatory, he saith :



*Twentieth.* I have seen the Letters Patent of the United States, granted to Jonas P. Fairlamb, dated January 19th, 1833, and the drawings and specification thereof, annexed to said patent. I do not see that there is anything in said description or drawings, which is described or claimed in said Winans's said patent.

To the twenty-first interrogatory, he saith :

*Twenty-first.* A mechanic of ordinary skill in car building, having knowledge of said Fairlamb's patent and drawings, and particularly of figure 2 of said drawing, would be enabled without exercising invention, to construct eight-wheel double-truck cars, substantially like those used by the Eastern Railroad, and like those in common use on the roads of the United States. And if so constructed, they would, in my opinion, embody the essential principles of the eight-wheel railroad car in common use, and would attain the beneficial results pretended to be attained by said Winans, in his patent.

To the twenty-second interrogatory, he saith :

*Twenty-second.* I have examined the model of the Allen steam carriage, marked Horatio Allen, now shown me by the Commissioners, and identified by my signature. The drawings of the said steam carriage, marked G and H, are not now shown me ; the truck-frames here shown are oblong, each truck having four wheels ; the bearing distance being equal to the width of the track. It shows springs and pedestals. The car body rests upon a centre pin or king-bolt, and the wheels are fastened by pedestals and springs. It also shows friction rollers, to prevent the cars from rocking, and allow them to curve to the irregularities of the road. The springs here shown are so shown with the small leaves downwards, fastened at each end by a plate. The wheels revolve with the axles. I should think it was calculated to attain the practical benefits of the eight-wheel railroad cars now in general use. The construction and arrangement of the running gear are substantially the same as those now in general use. I think it contains the construction and organization necessary to produce the beneficial results stated and claimed to be accomplished in the said Winans's specification of Oct. 1, 1834. And no part of the invention described by Winans in his specification is embodied therein.

To the twenty-third interrogatory, he saith :

*Twenty-third.* I have examined the model of the eight-wheel double-truck railroad car, marked "G. Bryant," and identified it with my signature. It shows two trucks, of four wheels each, two bolsters and bolster plates, the car frame resting upon segments and not friction rollers, the object of which is to prevent too much lateral motion. The trucks project beyond each end of the frame of the body. The distance of the wheels, from centre to centre, is about equal to the gauge of the track. The trucks are placed sufficiently distant from each other to allow them to curve. The wheels revolve upon the axles, and the draft is applied by the middle of the end of the truck. It is adapted to pass all the inequalities and curves as well as the straight track of the roads. It is constructed and operated upon the same mechanical principles with the cars used by the Eastern Railroad, and with those now in general use on the railroads of the United States. The model of the Eastern Railroad car as such is not now shown to me, and I cannot, there-

fore, say that it corresponds in principle with it. Model K shows similar mechanical principles.

In answer to the twenty-fourth interrogatory, he saith :

*Twenty-fourth.* There is not, according to my judgment, any part of the invention described by Winans, in his Letters Patent, embodied in said Quincy car, unless it be the application of the bolster, which, Winans says, "should be the same as a common road waggon." The application is shown in the model, and is all that I see in the model of the invention described by Winans.

In answer to the twenty-fifth interrogatory, he saith :

*Twenty-fifth.* A mechanic of ordinary skill and knowledge, in building railroad cars, having knowledge of the aforesaid Quincy car, in 1829 or 1830, would have been able, at that time, without the exercise of invention of his own, to construct double-truck eight-wheel railroad cars, substantially like those now in general use, so far as regards the arrangement of the wheels, and the connection of the trucks with the body of the cars.

In answer to the twenty-sixth interrogatory, he saith :

*Twenty-sixth.* I have seen and examined the Treatise of Wood, published in 1825, the work of Tredgold, and that of Strickland, published in 1826. The mode of drawing railroad cars, by a coupling from the middle of the ends of the bodies, was well known and publicly used, prior to 1830, and is shown and described in said printed books.

In answer to the twenty-seventh interrogatory, he saith :

*Twenty-seventh.* I have examined the last mentioned printed books, and state that the distance from the bearing points of the wheels is about equal to the gauge of the track, and is the same with that of the wheels now in use on the best constructed cars in the United States.

In answer to the twenty-eighth interrogatory, he saith :

*Twenty-eighth.* Springs and pedestals, as now used on the eight-wheel double-truck cars, were applied to the four-wheel cars, described and shown in the American edition of Wood's Treatise, in 1832, and in the model of Allen steam carriage.

In answer to the twenty-ninth interrogatory, he saith :

*Twenty-ninth.* The mode of causing the wheels of railroad cars to revolve with the axles, was a well known equivalent, prior to 1830, for the mode of causing them to revolve on the axle trees. These equivalents are described and shown in Wood's treatise (London edition), Tredgold, and Strickland. I have constructed cars both ways.

In answer to the thirtieth interrogatory, he saith :

*Thirtieth.* It does not, in my opinion, involve any change in the mechanical principles or modes of operation in said Quincy car, to substitute for the axletrees, axles revolving with the wheels ;

Or larger wheels instead of those used, so as to cause the flanges of the wheels on each truck to approach very near each other ;

Or to draw the said car by the body instead of drawing it by the truck ;

Or to increase the length of the body of the platform ;

Or to place a box upon the top of said platform, so as to become a passenger car ;

Or to cause it to run at a greater or less rate of speed ;

It would not, in my opinion, require invention to make any or all of these changes.

In answer to the thirty-first interrogatory, he saith :

*Thirty-first.* In the construction and operation of the double-truck eight-wheel car, the distance of the flanges from each other, is not, of *itself*, considered material. The distance may be varied by substituting larger or smaller wheels, without in any way changing the mechanical principles or mode of operation of the car containing them.

To the thirty-second interrogatory, he saith :

*Thirty-second.* The distance of the bearing points upon the rails, of the wheels in each truck, ought to be equal to the gauge of the track, and is, I think, material and essential to the operation of the car. I think a car having the wheels of the truck so arranged, will run steadier,—more than a car built after Mr. Winans's specification.

To the thirty-third interrogatory, he saith :

*Thirty-third.* Maintaining the axles of the wheels in each truck, at a fixed and uniform distance from each other, is material and essential in the construction and operation of the eight-wheel car. It keeps them more steady upon the track, and makes them less liable to run off.

To the second (printed) interrogatory on the part of the Respondent, he saith :

2. I am a blacksmith and machinist by trade. I have been engaged in the business of building cars, since 1833. I have been all that time in business on my own account, and have thus become practically acquainted with the mechanical principles of machinery and of railroad machinery, as pertaining to the building of cars and their running gear.

To the third interrogatory, he saith :

3. I am familiar with the mechanical principles of the construction and operation of double-truck eight-wheel railroad cars, used by the Eastern Railroad Company, and those now in general use on the railroads of the United States.

To the fourth interrogatory, he saith :

4. I have examined the specification of the letters patent, issued to Ross Winans, dated October 1, 1834, a copy whereof is annexed to the commission.

To the fifth interrogatory, he saith :

5. I have examined the model B, now shown me by the Commissioner, and identified with my signature.

It is a true representation of the car described and recommended in said specification, except in this : that the bearing points should have been on the outside instead of inside, as shown here ; that is the only difference.

To the sixth interrogatory, he saith :

6. So far as relates to the construction, organization and arrangement of the double-truck eight-wheel car, now used by the Eastern Railroad, and in common use upon the railroads of the United States, in order to enable them to run smoothly, evenly and safely over the curves, straight track and irregularities of railroads, I consider that two four-wheel trucks under one body, placed upon a bolster about 7 feet from the end of the car, and the bearing points of the wheels at or about equal to the gauge of the track, with springs, boxes and



pedestals attached; the trucks should be arranged so as to receive the weight of the body of the car upon their centres; they should have friction rollers, or their equivalent, to prevent them from rocking, and allow them to curve to the road; the trucks must be well braced with inside and outside beams, to keep them strong and square; the centre of each truck should have a king-bolt connection, to keep the car and truck together; all these things essential and elemental.

To the seventh interrogatory, he saith :

7. The eight-wheel double-truck railroad cars now in general use upon the Eastern Railroad and upon the roads in this country, have improvements or inventions applied to them not described in Winans's specifications. The truck-frame and short spring I consider a decided improvement over the long spring; so with the boxes and pedestals to keep the truck square; so placing the wheels apart, making the centre the width of the track. I think the circular plates and friction rollers an improvement. All the cars have safety beams in the truck; have brakes, which are often put between the wheels, but more generally fore and aft; have couplings. Some use the rubber spring, under or between the bolster, and the elliptic spring (single) on the journals.

To the eighth interrogatory, he saith :

8. The bodies of the said eight-wheel cars now in common use, are so constructed as to be able to be removed from the trucks, whenever desired, by taking out the king-bolt.

The bolster of the trucks are usually placed about six or seven feet from the end of the platform of the body of the cars, or about three or three and a half feet from the end of the body.

To the ninth interrogatory, he saith :

9. Said cars have side bearings or friction rollers to keep the car steady.

To the tenth interrogatory, he saith :

10. Check chains are in use; they are to keep the truck from getting away from the track, and from turning sideways, if it should get off the track.

To the eleventh interrogatory, he saith :

11. Increasing or diminishing the length of the body of the eight-wheel car, while the trucks are placed at the same distance from the end of the body, does not introduce any new or different mechanical principles into the organization of the car, nor does such change require the exercise of invention.

To the twelfth interrogatory, he saith :

12. Having the axles of the wheels of a passenger car connected by long springs, as described in specification, is unsafe, though practicable. If a spring sufficiently strong was applied, it would be safe, though the comfort of the passenger would be greatly increased by having India rubber springs in addition.

To the thirteenth interrogatory, he saith :

13. I have examined the drawing of the railroad freight car attached to the commission. It does not show a car constructed with running gear particularly described and recommended in his specification. In his specification, Mr. Winans claims a long spring on each side of the truck, connecting the two wheels together, while the drawing shows a spring on each axle. In the specification, he places the



long leaves of the spring downwards, while in the drawing the long leaves are upward. The drawing shows a rigid wheel frame, and spring chairs holding each end of the spring, while none is described in the specification. The drawing shows brakes between the wheels, while none is described in the specification. The draft represented in the drawing is from the middle of the end of the body, while none is described in his specification. In the drawing the bolsters are placed about seven feet from the end of the platform, while the specification places them at or near the end of the body. The wheels, by the specification, are directed to be placed as near together as possible, without the flanges touching, so as to act, as nearly as can be, like a single wheel; and the drawing shows wheels placed distant from each other, with a brake between them. This car shows a bolster different from the specification, in this: the drawing represents a bolster and socket, XY, while the specification calls for a plain bolster, of wood or iron, similar to that of a road waggon.

[Printed interrogatories 14 to 38, inclusive, are identical with special interrogatories 9 to 33, before propounded.]

#### *Cross-Interrogatories.*

To the first cross-interrogatory on the part of Complainant, he saith:

*First X.* We build eight-wheel cars similar to those now in common use, upon orders from companies requiring them. That is the only authority we have for building them.

To the second cross-interrogatory, he saith:

*Second X.* The point of draft in the first eight-wheel car that I ever saw, namely, the "Victory," was, I think, applied to the middle of the end of the body, though I am not certain.

To the third cross-interrogatory, he saith:

*Third X.* On page 94 of Tredgold's Treatise, the following language is used:—"In the case where eight wheels are applied to support one body, if the body rests upon the wheel frame of each set of four wheels, in the middle of its length, [see Fig. 26, plate 4,] and is connected with those frames, so as to allow the greatest possible change of level on the rails." On page 179, "The body of the waggon rests on the wheel-frames AA, and is connected to them by an axis on which the frames turn, when from any inequality the axes of the wheels are not in the same plane." [Fig. 26, plate 4.]

To the fourth cross-interrogatory, he saith:

*Fourth X.* The motion of the truck, shown in Tredgold's Treatise, is not only vertical, but also lateral; and this is the only description and drawing I find in the book referring to this subject.

To the fifth cross-interrogatory, he saith:

*Fifth X.* My answers to the eighteenth and nineteenth direct interrogatories were based on the text and plate in Tredgold's Treatise, and upon model A.

To the sixth cross-interrogatory, he saith:

*Sixth X.* On drawing facing page 184 of Tredgold, Fig. 1 indicates that the draft is from the end of the body of the car.

To the seventh cross-interrogatory, he saith:

*Seventh X.* The drawings to which I have referred, in my answer to the 27th interrogatory, shows the draft applied to the middle of the ends of the four-wheel car. I cannot say how the bearing points of the

wheels compare with the relative length of the whole car in each case.

The cars now in common use are of different lengths,—some 30, to 35, to 40 feet. We place the trucks having the same bearing points at the same distance from the end of the cars, only making the body stronger in proportion to its length.

To the eighth cross-interrogatory, he saith :

The principle involved in the eight-wheel car consists of two four-wheel trucks, one truck under each end of the body of the car, with side frames and ends, and inside frames to stiffen the trucks ; one spring on each journal ; box and pedestal on each, and spring chair on each end of the spring ; the bearing points of the wheels are about equal to the gauge of the track ; bolsters and pivot plates to allow the car to curve on the road ; the king-bolt to connect the body and the truck together ; the bolster of the truck is placed about seven feet from the end of the platform ; the draft is applied to the middle of the end of the body. These are all that I remember. We use a swinging bolster and two gum springs under each bolster.

To the ninth cross-interrogatory, he saith :

*Ninth X.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, until they were propounded to me by the Commissioners.

*In answer to Interrogatories proposed on behalf of the Respondents to Harman Yerkes and others.*

To the first interrogatory, he saith :

*First.* I have already answered this interrogatory.

To the second interrogatory, he saith :

*Second.* In 1833-4, my place of business was in Broad Street, above Vine, where I was engaged in business on my own account. I have visited Durkee, Slaymaker, and Tomlinson's office ; it was in Market Street, near Eighth. I have visited there on different times and different occasions, on business always.

To the third interrogatory, he saith :

*Third.* The office was in Market Street, the business street of the city ; I cannot say how much or how frequently the office was visited, inasmuch as my business with them was of short duration, and when finished I went about my own business. Presuming the question to refer to 1833-4, I state that a man named *First* or *Fers*, or something similar, was indoor agent or book-keeper, and Harman Yerkes was outside agent or general agent.

To the fourth interrogatory, he saith :

*Fourth.* I did not, at any time, see any drawing of the running part and body of such a car, described in the fourth interrogatory, and know nothing about it.

To the fifth interrogatory, he saith :

*Fifth.* I know nothing of the matters inquired of in this interrogatory.

To the sixth interrogatory, he saith :

*Sixth.* I think that, in the spring of 1834, or fall of 1833, I was invited by Mr. Emley to his shop, or I called upon business—I can't say which—and showed me the model of an eight-wheel car. Mr. Emley was head man in the shop. The car "Victory," which I after-

wards saw upon the Norristown road, was built after this model. It has been so long ago that I cannot say, with certainty, where I saw the model first; but I saw it before I saw the car "Victory" upon the Norristown road. I do not know whether or not the said model corresponded with any drawing. The model was made by Layman Proctor, as Proctor himself informed me. I think the model was made in 1833.

To the seventh interrogatory, he saith :

*Seventh.* There was a four-wheel truck under each end, but I did not examine it particularly. The car had a bottom sunk in the centre. I cannot now, after a lapse of twenty years, describe it fully. The car Victory, which I saw upon the Norristown road, I examined thoroughly, and am thus enabled to give the description of the car which I have given in my answers to other interrogatories.

To the eighth interrogatory, he saith :

*Eighth.* I have answered this interrogatory in my answer to the eighth direct interrogatory, on the part of the Respondent.

To the ninth interrogatory, he saith :

*Ninth.* I don't know who furnished the means to build said model and said car. Mr. Emley gave directions to build them. I don't know for whom they were built.

To the tenth interrogatory, he saith :

*Tenth.* I think Harman Yerkes had charge of the said car, while it was running on the State road. I have heretofore described said car.

To the eleventh interrogatory, he saith :

*Eleventh.* I know nothing of the matters inquired of in this interrogatory.

To the twelfth interrogatory, he saith :

*Twelfth.* The said car was carried, after she was first put to running, to the road of the Norristown Company; she was used upon that road, but whether at the opening thereof or not I can't say.

To the thirteenth interrogatory, he saith :

*Thirteenth.* I never was engaged on the said road; the said company became owners of said car Victory, by purchase. I don't know what sum she brought.

To the fourteenth interrogatory, he saith :

*Fourteenth.* I have answered this interrogatory in my answer to the eighth.

To the fifteenth interrogatory, he saith :

*Fifteenth.* I can't speak as to the model positively, though I think it was a fac simile of the car "Victory," which was the same in principle as the eight-wheel car now in general use. Similar cars, with the exception of the sunken body, are now in use on the Columbia road, on the Camden and Amboy road, on the Wilmington and Baltimore and other roads.

To the first cross-interrogatory, he saith :

*First X.* I have already answered this interrogatory in my answer to the eighth cross-interrogatory, on the part of the Complainant.

JOHN MURPHY.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Com's, &c.*



## DEPOSITION OF JOHN C. A. SMITH.

DECEMBER 16, 1853. John C. A. Smith, being duly sworn on the part of the Respondents, deposeth and saith as follows :

To the first interrogatory, he saith :

*First.* My name is John C. A. Smith ; aged forty-four years ; place of business and residence in Baltimore ; my business originally was coach making. I have been employed with the Baltimore and Susquehanna Railroad Company since 1831, and am still in their employ, as foreman of the car shop.

To the second interrogatory, he saith :

*Second.* I have been engaged, as I have stated, since 1831, in the construction of cars, and, from that time to the present, I have paid particular attention to, and have acquired practical knowledge concerning the mechanical principles of railroad machinery.

To the third interrogatory, he saith :

*Third.* I am familiar with the mechanical principles of the construction and operation of double-truck eight-wheel railroad cars, used by the Eastern Railroad Company, and those now in general use on the railroads of the United States.

To the fourth interrogatory, he saith :

*Fourth.* I have examined the specification of the letters patent, issued to Ross Winans, dated October 1st, 1834, or a copy thereof, which is annexed to the commission.

To the fifth interrogatory, he saith :

*Fifth.* I have examined the model now shown to me by the Commissioner, marked B. It is a true representation of the car described and recommended in said specification ; it does not differ in any respect therefrom.

To the sixth interrogatory, he saith :

*Sixth.* In order to enable the double-truck eight-wheel car, now used by the Eastern Railroad Company, and in common use on the railroads of the United States, to run smoothly, evenly, and safely over the curves, straight track, and irregularities of the railroad, there should be a rigid rectangular truck-frame, each truck containing four wheels, springs and boxes, with the wheels fixed parallel, at an equal distance apart, the bearing points of the wheels being about equal to the width of the track, and bolster, and pivot, or transom plate. The centre of each truck should have a king-bolt, to enable the truck to adapt itself to the curves of the road. The cars should have side bearings, to prevent rocking, and to give it easy motion on the road. These I consider essential and elemental.

To the seventh interrogatory, he saith :

*Seventh.* The eight-wheel double-truck railroad cars now in general use upon the Eastern Railroad, and upon the roads in this country, have improvements or inventions applied to them not described in said specification.

They have patent lubricating boxes ; Kite's safety beam-pendulum or swinging bolsters, pedestals to the boxes, male and female transom plates, spring couplings to pull by, seats with shifting backs, metallic bearing boxes, India rubber springs, patent brakes, pedestals, and the rigid wheel frame. None of these are described in Winans's specification.



To the eighth interrogatory, he saith :

*Eighth.* The bodies of the said eight-wheel cars, now in common use, are constructed so as to be able to be removed from the trucks whenever desired, by taking out the king-bolt.

The bolster of the trucks is usually placed from five to seven feet from the end of the body. Five feet is the distance that I usually place them.

To the ninth interrogatory, he saith :

*Ninth.* Said cars have side bearings, to prevent too much lateral motion.

To the tenth interrogatory, he saith :

*Tenth.* Check chains are in use to prevent the trucks from turning round, in case, through some accident, the car should run off the track.

To the eleventh interrogatory, he saith :

*Eleventh.* Increasing or diminishing the length of the body of the said eight-wheel car, while the trucks are placed at the same distance from the ends of the body, does not introduce any new or different mechanical principles into the organization of the car, nor does such change require any exercise of invention.

To the twelfth interrogatory, he saith :

*Twelfth.* My opinion is, that having the axles of the wheels of a passenger car connected by long springs, is unsafe.

The wheels could not be kept parallel to each other, as the weight, when not equally divided, would cause the spring to yield, and thus throw the wheels out of parallelism, rendering the cars more liable to be thrown from the track. It is practicable, but in my opinion, unsafe.

To the thirteenth interrogatory, he saith :

*Thirteenth.* I have examined the drawing of the railroad freight car annexed to the commission. It does not show a car constructed with running gear in the manner described in Winans's specification. This drawing shows rigid truck-frames, springs, and boxes, instead of the strong double spring, as described by Mr. Winans. It also shows a coupling from the centre of the body, while none is described ; it represents the wheels wider apart, with brakes between, while none is mentioned in his specification, and he recommends that the wheels be placed close together. The trucks are placed about five feet from the end of the body, while Mr. Winans directs them to be placed at or near the ends of the body. The drawing also represents a conical pivot marked X, with sockets forming a bolster in one piece, with a lower bolster and pocket Y to correspond. There are side bearings. The specification describes a plain bolster of wood or iron, reaching from spring to spring, united to an upper bolster by a king-bolt, swiveling in the manner of a front bolster of a common road waggon. Mr. Winans, in his specification, describes a passenger car, and the drawing represents a freight car. The drawing shows side bearings, while the specification says nothing about them. These are the only differences that I now observe.

To the fourteenth interrogatory, he saith :

*Fourteenth.* I have seen and examined the Repertory of Arts, Manufactures and Agriculture, Vol. 24, second series, published in London, A. D. 1814, more particularly that part of said volume which includes the specifications and drawings of the patent of William and E. W. Chapman.

To the fifteenth interrogatory, he saith :

*Fifteenth.* I have examined the model K. Said model does truly and correctly represent a railroad car or carriage, described and shown in said book and drawings.

To the sixteenth interrogatory, he saith :

*Sixteenth.* A car builder of ordinary skill and knowledge of his profession, would be able, by aid of said specification and drawings, and without the necessity of exercising his own invention, to construct eight-wheel railroad cars, substantially the same in principle as those now used by the Eastern Railroad, and other railroads generally, so far as respects the manner of arranging and connecting the eight wheels, and the connection of the trucks with the body of the cars.

To the seventeenth interrogatory, he saith :

*Seventeenth.* Said Chapman car, as shown in said book and drawings, has side bearings and centre pivot, and rigid rectangular wheel-frame.

To the eighteenth interrogatory, he saith :

*Eighteenth.* I have measured the distance between the bearing points of the wheels. It is about equal to the width of the track.

To the nineteenth interrogatory, he saith :

*Nineteenth.* This model now before me, may be made to represent both the six and the eight-wheel carriage.

To the twentieth interrogatory, he saith :

*Twentieth.* I have examined a work called "A Practical Treatise on Railroads and Carriages," by Thomas Tredgold, published in London, England, in 1825, and the drawings therein referred to. I find therein a drawing and description of a double-truck eight-wheel railroad car.

To the twenty-first interrogatory, he saith :

*Twenty-first.* The car shown in the drawing has two rigid rectangular wheel-frames, of four wheels each, the middle of each truck being united to the body by means of a swiveling bearing, allowing the trucks to swivel freely. The trucks are far enough apart to keep them from coming in contact with each other; the car body projects over the frames, and the bearing points of the wheels are about equal to the gauge of the track. A car constructed upon the plan described in said Tredgold, would swivel to the curves of the road, in the same manner as the cars now in general use.

To the twenty-second interrogatory, he saith :

*Twenty-second.* I have examined the model marked A, and it is a correct representation of said eight-wheel car of Tredgold. It does not differ, in any respect, therefrom, except that no coupling for the eight-wheel cars is described or shown in the said drawing of Tredgold. He describes and shows a coupling for four-wheel cars.

Model C is not a correct model of said eight-wheel car, or of any car described by him. The bolster here is made fast to the body of the car, and does not turn as described by Tredgold.

To the twenty-third interrogatory, he saith :

*Twenty-third.* The eight-wheel car of said Tredgold, and the eight-wheel cars used by the Eastern Railroad, and in general use in this country, are, so far as regards the running gear, in their mechanical principles and mode of operation, substantially identical.

To the twenty-fourth interrogatory, he saith :

*Twenty-fourth.* The Tredgold car is calculated to conform to all the irregularities of railroads, and it is calculated to answer the purposes and objects set forth in Winans's specification, as designed to be accomplished by him.

To the twenty-fifth interrogatory, he saith :

*Twenty-fifth.* I have seen the letters patent of the United States, granted to Jonas P. Fairlamb, dated January 19th, 1833, and the drawings and specifications thereof; I don't see any part of the invention described or claimed in said Winans's said patent, described or shown in said Fairlamb's patent or drawings.

To the twenty-sixth interrogatory, he saith :

*Twenty-sixth.* A mechanic of ordinary skill in car building, having knowledge of said Fairlamb's patent and drawings, and adopting the truck in fig. 2, would be enabled, without exercising invention, to construct eight-wheel double-truck cars, substantially like those used by the said Eastern Railroad, or like those now in common use on the roads of the United States; and if so constructed they would, in my opinion, embody the essential principles of the eight-wheel railroad car in common use, and would attain the beneficial results pretended to be obtained by said Winans, in his said patent.

To the twenty-seventh interrogatory, he saith :

*Twenty-seventh.* I have examined the model of the Allen steam carriage, marked "Horatio Allen," now shown me by the Commissioner.

The drawings of said steam carriage, marked G and H, are not now shown me.

There are two four-wheel truck frames, supporting the body of the car. There are springs and pedestals by which the truck-frame is united to the axis of the wheels. Each truck has a bolster running from side to side, and is connected with an upper bolster, on which the body of the car rests, by means of a king-bolt, enabling the trucks to swivel to the curves of the road. The car also shows side bearings, to keep it steady while in motion. The bearing points of the wheels are about equal to the width of the track. It is calculated to attain the practical benefits of the eight-wheel cars now in general use. The construction is somewhat different, but in the mechanical principles and arrangement of the running gear it is substantially the same as that of the eight-wheel cars now in general use. It contains the construction and organization necessary to produce the same beneficial results stated and claimed to be accomplished in said Winans's specification, of Oct. 1, 1834.

The bolster described in said Winans's specification is embodied in this car; but this I do not consider Mr. Winans's invention.

To the twenty-eighth interrogatory, he saith :

*Twenty-eighth.* I have examined the model of the eight-wheel double-truck railroad car, now before me, marked "G. Bryant."

This car has two rigid rectangular wheel frames, of four wheels each, covered by a platform. The wheels revolve on the axles. It has bolsters in the truck, something similar to a waggon bolster; two bearing plates and side bearings. There is a bolster on top, on each truck, connected by timbers, running lengthwise from one bolster to the other. Through these bolsters are two king-bolts, one on each truck,



allowing the truck to swivel to the road. The bearing points of the wheels are about equal to the gauge of the track, and the trucks are a sufficient distance apart to allow them to swivel without interfering. These trucks project beyond the bearing platform or body, and the coupling is from the middle of the end of the truck.

The wheels of this car are of much less diameter than those now used.

It is adapted to pass all the curves and irregularities, as well as the straight track of the road.

It is constructed and operated upon the same mechanical principles with the cars used by the Eastern Railroad, and those now in general use on the railroads of the United States.

To the twenty-ninth interrogatory, he saith :

*Twenty-ninth.* I don't see any part of the invention described by Ross Winans in his letters patent, embodied in the said Quincy car, excepting the bolsters.

To the thirtieth interrogatory, he saith :

*Thirtieth.* A mechanic of ordinary skill and knowledge in building railroad cars, having knowledge of the aforesaid Quincy car, in 1829 or 1830, would have been able at that time, without the exercise of invention of his own, to construct double-truck eight-wheel railroad cars, substantially like those now in general use, so far as regards the arrangement of the wheels and the connection of the trucks with the body of the cars.

To the thirty-first interrogatory, he saith :

*Thirty-first.* I have examined the treatise of Wood, published in 1825; the work of Tredgold and that of Strickland, published in 1826.

The mode of drawing railroad cars, by a coupling from the middle of the ends of the bodies, was well known and publicly used, prior to 1830, and is shown in said books.

To the thirty-second interrogatory, he saith :

*Thirty-second.* The works of Tredgold and Strickland, show the distance of the bearing points of the wheels of the cars, there shown or described, to be about equal to the gauge of the track; the same as now used in the best constructed cars in use in the United States.

To the thirty-third interrogatory, he saith :

*Thirty-third.* Springs and pedestals, as now used on the eight-wheel double-truck cars, were applied to the four-wheel cars described and shown in the American edition of Wood's treatise, in 1832, and in said Allen's model.

To the thirty-fourth interrogatory, he saith :

*Thirty-fourth.* The mode of causing the wheels of railroad cars to revolve with the axles, was a well known equivalent, before the year 1830, for the mode of causing them to revolve on the axletrees, and as shown in Strickland, Wood and Tredgold, before referred to.

To the thirty-fifth interrogatory, he saith :

*Thirty-fifth.* It does not, in my opinion, involve any change in the mechanical principles or modes of operation, in said Quincy car, to substitute for the axletrees axles revolving with the wheels;

Or larger wheels instead of those used, so as to cause the flanges of the wheels on each truck, to approach very near each other;



Or to draw the said car by the body, instead of drawing it by the truck ;

Or to increase the length of the body of the platform ;

Or to place a box upon the top of the said platform, so as to become a passenger car ;

Or to cause it to run at any greater or less rate of speed ;

It would not require, in my opinion, invention to make any or all of these changes.

To the thirty-sixth interrogatory, he saith :

*Thirty-sixth.* In the construction and operation of the double truck eight-wheel car, the distance of the flanges from each other, *of itself considered*, is not material.

It may be varied without in any way changing the mechanical principles or mode of operation in the car containing them, by increasing or diminishing the diameter of the wheels.

To the thirty-seventh interrogatory, he saith :

*Thirty-seventh.* The distance of the bearing points upon the rails, of the wheels in each truck, is material and essential to the operation of the cars.

I think, when so placed, the car will run more steadily, and will not be liable to so great motion, as when the wheels are placed close together.

To the thirty-eighth interrogatory, he saith :

*Thirty-eighth.* It is material and essential that the axles of the wheels in each truck should be maintained at a fixed and uniform distance from each other. The wheels should preserve their parallelism, and would thus be better enabled to keep the track.

To the thirty-ninth interrogatory, he saith :

*Thirty-ninth.* I do not know any fact or circumstance, in my opinion pertinent to the issue between the parties and beneficial to the Defendant.

To the fortieth interrogatory, he saith :

*Fortieth.* In my opinion the theory of Winans, for constructing or arranging the eight-wheel car, as set forth in his patent, is incorrect. Cars thus constructed would have a lateral motion—would be unsteady and unsafe on the road. My opinion is founded upon practical knowledge on such subjects. The bearing points of the wheels are too close together, and the consequence would be that at a high velocity, the cars would have too much lateral motion, and be liable to jump the track.

To the first cross-interrogatory, he saith :

*First X.* I have had experience in the construction, arrangement, and examination of machinery, so far as it relates to the construction of cars and running gear thereof, since the year 1831.

To the second cross-interrogatory, he saith :

*Second X.* I have been and am particularly conversant with the construction of running apparatus of railroad cars or carriages, and I have paid particular attention thereto, as foreman of the car shop of the Baltimore and Susquehanna Railroad Company since 1831. It was my duty to superintend the construction of the cars and the application of such apparatus.

To the third cross-interrogatory, he saith :

*Third X.* I have been once examined as an expert in a court of justice in a patent case. The subject in dispute was Knight's patent boxes.

To the fourth cross-interrogatory, he saith :

*Fourth X.* I have not been accustomed to the examination and comparison of machinery, with a view to forming and expressing, or acting upon an opinion as to the substantial identity between two or more machines or combinations of apparatus.

To the fifth cross-interrogatory, he saith :

*Fifth X.* I am, as I have stated, foreman of the shop of the Baltimore and Susquehanna Railroad Company. It is a part of my duty or employment, to attend to the construction and arrangement of the running gear of railroad cars and carriages.

To the sixth cross-interrogatory, he saith :

*Sixth X.* I am not practically or theoretically acquainted with railroad engineering.

I fully understand the principles involved in the construction and operation of railroad cars of various kinds, and the properties essential to their proper operation under the present condition of railroad construction and engineering. I have such a knowledge of the subject as will enable me to compare the different construction of cars, and to judge therefrom whether they are practically adapted to answer the purposes required of railroad cars, under the conditions of high rates of speed, steadiness of movement, and the curvature and irregularities of the road commonly found in the working of railroads in this country.

To the seventh cross-interrogatory, he saith :

*Seventh X.* It is my opinion, as a practical mechanic, that it is important and essential to the proper operation of an eight-wheel car, that it should be able to move round curves in the road with the least practicable friction between the flanges of the wheels and the rails.

To the eighth cross-interrogatory, he saith :

*Eighth X.* The friction between the flanges of the wheels and the rails will be proportionate to the resistance which the wheels offer to the guidance of the rails.

To the ninth cross-interrogatory, he saith :

*Ninth X.* The wheels of a four-wheel car, or of a truck of an eight-wheel car, will not run upon a curve with less friction between the flanges and the rails, the nearer the axles of the wheels are to each other, as set forth in the specification of Winans.

Placing the wheels close together, as Winans specifies, would produce lateral motion in turning the curves. Such motion would produce lateral friction on the flanges of the wheels, and would not, in my opinion, produce the effects described by Winans.

To the tenth cross-interrogatory, he saith :

*Tenth X.* The trucks of an eight-wheel car will not, independently from other considerations, run upon the curve, and over the irregularities of the road, and yield to the guidance of the rails with the least friction, when the trucks have the greatest freedom of motion. There will be less friction on the rails, and sufficient freedom of motion given to the truck, if the bearing points of the wheels be equal to the width of the track.

To the eleventh cross-interrogatory, he saith :

*Eleventh X.* I am not sufficiently acquainted, from personal knowledge, reading, or otherwise, with the state of railroad engineering, at and before the date of said Winans's patent, and particularly prior to 1830, to compare the present advanced state of railroad engineering with what then existed.

To the twelfth cross-interrogatory, he saith :

*Twelfth X.* In my opinion, it is important and essential to the running of cars at high speeds, such as have been practised since the time of said Winans's invention, that they should be made in such a manner as to insure greater steadiness of motion than was attained by the four-wheel cars.

Making the car body of great length, as compared with the modes before practised, and supporting the same at or near its ends, is essential to the attainment of greater steadiness of motion at high velocities, than could be obtained by the four-wheel cars, as formerly constructed.

To the thirteenth cross-interrogatory, he saith :

*Thirteenth X.* It is, in my opinion, essential to the proper construction of an eight-wheel car, that it shall have the capacity to work with other cars in a long train, and in any part of the train in which it may be placed.

To the fourteenth cross-interrogatory, he saith :

*Fourteenth X.* It is important and essential to the proper working of the first car in a train, that while it is subjected to the whole draft of the train, its trucks shall have the same freedom of motion that any other truck in the train has.

To the fifteenth cross-interrogatory, he saith :

*Fifteenth X.* It is essential in order to give freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them.

To the sixteenth cross-interrogatory, he saith :

*Sixteenth X.* The model B truly represents the car described in Plaintiff's patent, in the extent of bearing surfaces therein described, but it does not show the extent of bearing surfaces as shown in the drawing. The freight car shown by the drawing is not shown by the specification.

To the seventeenth cross-interrogatory, he saith :

*Seventeenth X.* Model B does not show the mode of attaching the draft, as is represented in the drawing of the Plaintiff's patent, nor is any described in the specification.

To the eighteenth cross-interrogatory, he saith :

*Eighteenth X.* The Plaintiff, by his specification, describes a "very strong spring, say double the usual strength employed for ordinary cars, the ends of which spring are bolted or otherwise secured to the upper sides of the boxes, the longer leaves of the springs being placed downwards, and surmounted by shorter leaves." He describes the truck thus: "Having thus connected two pair of wheels together, I unite them into a four-wheel bearing carriage, by means of their axles and a bolster of proper length, extending across between two pair of wheels, from the centre of one spring to that of the other, and securely fastened to the top of them." Winans considers these essential parts of his invention.



To the nineteenth cross-interrogatory, he saith :

*Nineteenth X.* I consider the use of springs essential to the proper construction of an eight-wheel car.

To the twentieth cross-interrogatory, he saith :

*Twentieth X.* The description and drawings of the Chapman engine, do represent the trucks of a railroad car like model K. The language is plain, and reads thus : p. 139. " Fig. VIII shows a carriage of six wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels are, as usual on railways, fixed to the body of the carriage ; 2, 2, and 3, 3, the other two pair are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised as that two-thirds of its weight should lie over the central point of the four wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two-thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates *c, c*, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal-waggon. And, if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described, (laying the weight equably upon both) and then, similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway."

The drawing alluded to is figure VIII, plate v, facing page 130, of said book.

There is no draft shown to the eight-wheel car ; but the draft to the four-wheel car, described in said work, is from the body.

To the twenty-first cross-interrogatory, he saith :

*Twenty-first X.* In the drawings and description by Tredgold, in his treatise, of a carriage with eight wheels, there is no representation or description of a draw link attached to the end of the body, as is shown in the model A. But he describes a coupling or draw-link to the four-wheel cars, and a mechanic of even ordinary skill could make the application without any change of principle whatever.

To the twenty-second cross-interrogatory, he saith :

*Twenty-second X.* In said Tredgold's treatise, there is a provision for enabling the truck or wheel-frame of said car with eight wheels, to swivel laterally, to conform to the curves of the road.

On page 179, he says, (plate IV, fig. 26.)

" A diagram to show how a waggon may be made with eight wheels, so that the stress of each wheel, on the rails of a railroad, may be equal. The body of the waggon rests on the wheel-frames at AA, and is connected to them by an axis, on which the frames turn, when, from any inequality, the axes of the wheels are not in the same plane."

On page 94 :

" When a carriage has more than four whels, the body must be sustained, so that its pressure may be divided equally among the wheels. In the case where eight wheels are applied to support one body, if the body rests upon the wheel-frame, of each set of four wheels, in the middle of its length, (see fig. 26, plate iv,) and is connected with those



frames, so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure."

To the twenty-third cross-interrogatory, he saith :

*Twenty-third X.* I have not said that any part of the said Winans's invention is embraced in the model or drawings of the Allen steam carriage.

To the twenty-fourth cross-interrogatory, he saith :

*Twenty-fourth X.* I have not said that any part of the invention of the said Winans is embraced in the said Quincy car.

To the twenty-fifth cross-interrogatory, he saith :

*Twenty-fifth X.* From all I know, a mechanic of ordinary skill, having all the knowledge possessed by the world in 1829 and '30, about the construction of cars, would not, I think, have known what the requirements and characteristics of a railroad passenger car must have been to enable it to move safely and smoothly over the curves and irregularities of a railroad as then or now constructed, at a rate of thirty miles an hour, and to perform the duties required of the ordinary eight-wheel car now in use.

To the twenty-sixth cross-interrogatory, he saith :

*Twenty-sixth X.* I consider the arrangement of railroad car wheels fixed firmly to their axles, and rotating with them, to be the same in principle as those rotating loosely upon fixed axles.

To the twenty-seventh cross-interrogatory, he saith :

*Twenty-seventh X.* The draft to the Quincy car is shown by the model to be applied to the truck. I never saw the car.

To the twenty-eighth cross-interrogatory, he saith :

*Twenty-eighth X.* I consider that the draft should be applied to the middle of the end of the body of the car; it allows the trucks greater freedom of motion, in going over curves, &c.

To the twenty-ninth cross-interrogatory, he saith :

*Twenty-ninth X.* The cars described in the works of Wood, Tredgold, and Strickland, referred to in the thirty-first interrogatory, as having the draft applied to the middle of the ends of the body, were four-wheel cars, and the wheels were attached to the said body.

To the thirtieth cross-interrogatory, he saith :

*Thirtieth X.* In every instance that has come to my knowledge, as existing prior to the invention of the Complainant, in which eight wheels were employed, arranged in bearing carriages or trucks, to sustain an independent body, the draft has been represented as applied to the truck instead of the body, when any mode of applying the draft has been shown.

To the thirty-first cross-interrogatory, he saith :

*Thirty-first X.* The drawings or description of the Chapman engine, referred to in the 14th direct interrogatory, or the drawings or description in Tredgold's Treatise, or the drawings or model of the Allen locomotive, or the model of the Quincy car, or either or all of them, would not teach a mechanic of ordinary skill and knowledge in the construction of cars, in the year 1830, that placing the wheels of the trucks very near together would reduce the friction between the flanges of the wheels and the rails over curves.

To the thirty-second cross-interrogatory, he saith :

*Thirty-second X.* The same drawings and descriptions would not have

taught such a mechanic, in the year 1830, that great stability of motion, when running at high velocities, could be attained by constructing the car body of great length, and supporting it at or near each end, upon two trucks thus constructed. A car body of *great* length would cause it to run unsteady. The trucks should be placed at a certain distance from the end, say from five to seven feet.

To the thirty-third cross-interrogatory, he saith :

*Thirty-third X.* The same drawings and descriptions would not have taught such a mechanic, in the year 1830, that in order to move over the curves and irregularities of a railroad, at a high velocity, with safety and stability of motion, and with the least practicable friction on the rail, that the trucks should have the greatest possible freedom to conform to the surface of the rails, and should not be constrained by the draft; but an ordinary mechanic, having knowledge of said books and drawings, and description of the four-wheel cars there shown, with the draft from the ends of the bodies, could make an easy application of it to the eight-wheel car.

To the thirty-fourth cross-interrogatory :

*Thirty-fourth X.* There is not, in the drawings and description aforesaid, any description of or allusion to any arrangement or modification in the construction of railroad cars, by which they might be run at high velocities, such as have been practised since 1830.

To the thirty-fifth cross-interrogatory, he saith :

*Thirty-fifth X.* The purpose shown and expressed in the drawings and descriptions above referred to, of the employment of eight-wheels in a car or carriage, is solely for the purpose of carrying great weights, and dividing the weight equally on eight wheels, in order not to place a greater load on each wheel than they and the rails could well bear.

To the thirty-sixth cross-interrogatory, he saith :

*Thirty-sixth X.* So far as my knowledge extends, such eight-wheel cars or carriages were not employed, previous to the year 1830, except to carry weights that could not be subdivided and carried upon four-wheel cars.

To the thirty-seventh cross-interrogatory, he saith :

*Thirty-seventh X.* I have not been employed by any person or persons, corporation or corporations, to assist in the preparation of the defence of this case, or to collect evidence to impeach the validity of the patent of Ross Winans, in controversy in this suit; and I am in no way connected with this suit excepting as a witness summoned to testify under the present commission, nor am I interested in any way in the result of this controversy.

To the thirty-eighth cross-interrogatory, he saith :

*Thirty-eighth X.* I am, as I before said, employed by the Baltimore and Susquehanna Railroad Company, as foreman of their car shop. The said company use eight-wheel passenger and freight cars both on their road.

To the thirty-ninth cross-interrogatory, he saith :

*Thirty-ninth X.* I have formed an opinion that the letters patent of Ross Winans, now in controversy in this suit, are invalid, for want of novelty.

I formed such opinion after reading his specification, and examining the books and models referred to in the direct interrogatories.

I have conversed with many persons about the invention of Winans, but I never knew what he did claim until I read the specification, and made such comparison. I can't say with whom I have thus conversed.

To the fortieth cross-interrogatory, he saith :

*Fortieth X.* I have not stated that I am a railroad superintendent. I am not a member of any association of railroad superintendents, nor of any committee thereof. I have not instructed, aided, or consulted with the counsel or solicitor for the Defendants in the preparation of the defence.

To the forty-first cross-interrogatory, he saith :

*Forty-first X.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, or any of them, except as propounded to me by the Commissioner.

To the first additional interrogatory, he saith :

*First.* I do not know any fact or circumstance tending to show whether or not the eight-wheel car, now in common use on railroads, was used with the knowledge of said Winans, and without objection or claim thereto on his part.

To the second additional interrogatory, he saith :

*Second.* It would not, in my opinion, introduce any new mechanical principle, or any new mode of operation, into the Chapman, Tredgold, Allen, or Quincy cars or carriages, if (instead of the bodies or platforms now shown or described) you should substitute longer bodies, retaining the same trucks or bearing carriages, and placing them under the body, thus substituted, at the same distance from the respective ends thereof.

To the third additional interrogatory, he saith :

*Third.* It would not, in my opinion, require invention to make that substitution.

To the fourth additional interrogatory, he saith :

*Fourth.* There is nothing in the descriptions or drawings of the said Tredgold car or carriage, which renders it essential that all the wheels shall be equidistant from each other; and if two trucks are placed remotely from each other, under one body, by the substitution of a longer body, there is nothing in such remoteness of the trucks from each other inconsistent or incompatible with the said description or drawings, or with the objects and purposes set forth by said Tredgold, in his said treatise.

To the fifth additional interrogatory, he saith :

*Fifth.* I answer this interrogatory as I have answered the last, reference being now had to the Chapman car or carriage, and the Chapman patent.

To the sixth additional interrogatory, he saith :

*Sixth.* I answer this interrogatory in the same manner that I have answered the fourth additional interrogatory, relation being had to the Allen steam carriage.

To the seventh additional interrogatory, he saith :

*Seventh.* There is nothing in the said Quincy cars (judging by the model thereof, and what I know of its structure and uses, and mode of operation), which renders it essential that all the wheels thereof should be equidistant from each other, under one body; and the change of a



longer instead of a shorter body (so that the same trucks should be coupled by the body, remotely from each other, while the body should be supported at or near the two ends) would be in nowise inconsistent or incompatible with the objects and purposes for which the Quincy car was designed and used.

To the eighth additional interrogatory, he saith :

*Eighth.* There is a difference between the mechanical theory, according to which said Winans, in said specification, recommends and claims the arrangement of the wheels, and the connection thereof with the body, and that mechanical theory on which the running gear of the eight-wheel cars, now in common use, is arranged and connected with the body.

Winans's theory is to place the wheels together, as close as they possibly can be placed, without the flanges touching, so as to act like a single wheel. These wheels are connected together, by means of a strong spring bolted fast to the tops of the boxes on each side, with a bolster placed across the centre of the springs, upon the centre of which bolster the body rests. The trucks are placed at or near the end.

The mechanical theory of the cars now in use is to have a rigid rectangular truck-frame, connected by means of springs and boxes; the wheels are placed at an equal distance apart, and the bearing-points are about equal to the width of the track. Each truck is connected to the body, by a male and female transom plate; they have side bearings, and the bolster is about from five to seven feet from the end of the car.

I regard them as essentially different.

To the ninth additional interrogatory, he saith :

*Ninth.* It is not necessary, according to the specification of said Winans, in order to accomplish the purposes claimed by him, to use or employ very long bodies.

To the tenth additional interrogatory, he saith :

*Tenth.* A truck constructed with the bearing points of the wheels equal to the gauge of the track, would have sufficient freedom to enable it to conform to the curves of the road. It should not have the "greatest possible" freedom. Sufficient freedom would be given in its motion over the rails and curves and irregularities of the road, by placing the bearing points of the wheels as I have described. To give it too much freedom of motion would cause more friction upon the rails, and render it more liable to jump the track.

To the first additional cross-interrogatory, he saith :

*First.* I consider the theory of the Plaintiff, as shown in his specification to be, "The two wheels on each side of the carriage to be placed very near to each other; the spaces between their flanges need be no greater than is necessary to prevent their contact with each other. These wheels I connect together by means of a very strong spring, say double the usual strength employed for ordinary cars; the ends of which springs are bolted or otherwise secured to the upper sides of the boxes, which rest on the journals of the axles, the longer leaves of the springs being downwards, and surmounted by the shorter leaves. Having thus connected two pairs of wheels together, I unite them into a four-wheel bearing carriage, by means of their axles, and a bolster of proper length, extending across between two pairs of wheels, from the



centre of one spring to that of the other, and securely fastened to the tops of them." This I conceive to be Mr. Winans's theory.

To the second additional cross-interrogatory, he saith :

*Second.* I have no knowledge of the average rate of speed upon railways, prior to 1830. I think that railways were principally used for freight prior to that date.

To the third additional cross-interrogatory, he saith :

*Third.* So far as I have read, railways, prior to 1830, were constructed of such materials, and in such way, that distribution rather than concentration of the weight of the cars and of the locomotive was required.

To the fourth additional cross-interrogatory, he saith :

*Fourth.* I do not know whether or not there was more than one railway in England, prior to 1830, upon which passengers were habitually carried.

To the fifth additional cross-interrogatory, he saith :

*Fifth.* The use to which railways, prior to that time, were habitually put, in the course of their regular business, was the transportation of trains of merchandise by horse power and locomotives.

To the sixth additional cross-interrogatory, he saith :

*Sixth.* I should suppose that, prior to 1830, the average speed per hour was about six miles by horse power, and by locomotive it was from ten to fifteen.

To the seventh additional cross-interrogatory, he saith :

*Seventh.* I have never designed railroad cars.

JOHN C. A. SMITH.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Com'rs.*

#### DEPOSITION OF JACOB S. SHRYACK.

DECEMBER 13, 1853. Jacob S. Shryack being duly sworn on the part of the Respondents, deposeth and says as follows :

To the first interrogatory, he saith :

*First.* My name is Jacob Shryack ; aged forty-two years ; place of business and residence in Baltimore. I am foreman of the shop for building and repairing the passenger cars of the Baltimore and Ohio Railroad.

To the second interrogatory, he saith :

*Second.* I have had practical experience for a number of years, and have thus become acquainted with the mechanical principles of machinery of passenger cars—say for eighteen years. I first went into the employ of the Baltimore and Ohio Railroad Company in 1834, and have been, ever since that time, engaged in building, altering, and repairing passenger cars.

To the third interrogatory, he saith :

*Third.* I am familiar with the mechanical principles of the construction and operation of double-truck eight-wheel railroad cars, used by the Eastern Railroad Company, and those now in general use on the railroads of the United States.

To the fourth interrogatory, he saith :

*Fourth.* I have examined the specification of the letters patent issued to Ross Winans, dated October 1st, 1834, or a copy thereof, annexed to this commission.

To the fifth interrogatory, he saith :

*Fifth.* I have examined the model now shown to me by the Commissioner, marked B. It is a true representation of the car described and recommended in said specification.

To the sixth interrogatory, he saith :

*Sixth.* So far as relates to the construction, organization, and arrangement of the double-truck eight-wheel car, now used by the Eastern Railroad, and in common use upon the railroads of the United States, in order to enable them to run smoothly, evenly, and safely over the curves, straight track and irregularities of railroads, the parts and the arrangement thereof, which are, in my opinion, essential and elemental, I will state :—

I think, in the first place, that a rigid wheel-frame to preserve the axles in their parallelism, is very important and essential. The side timbers of this wheel-frame should be secured and strengthened by cross-pieces, well bolted, to keep the frame perfectly rectangular.

That the truck should be preserved in its rectangularity is, in my opinion, essential to the safety of the car. Each journal, with the object of preserving the parallelism of the axles, should be set in a pedestal secured by bolts to the wheel-frame. The bearing points of the wheels upon the track, should form, as nearly as may be, a perfect square ; the distance between these bearing points being the gauge of the track itself.

The car body rests on a bolster crossing the middle of the truck, a corresponding bolster being secured to the main sills of the car body. In these bolsters are set transom plates, male and female, through the centre of which passes a king-bolt. The connection of the car body and truck by these transom plates and king-bolts, should be such as to allow sufficient freedom to the trucks to swivel about the king-bolt, and adapt themselves to the curves of the road.

There are other parts and improvements to be found in most of the double-truck eight-wheel cars ; but I have mentioned the parts in my opinion essential and elemental.

To the seventh interrogatory, he saith :

*Seventh.* The rigid rectangular wheel-frame, described in my answer to the last interrogatory, which preserves the parallelism of the axles, and which is so constructed as to make the bearing points of the wheels upon the track equidistant with the gauge of the track itself, must be considered as a great improvement not described in said specification. The use of two springs on the side of each truck, one for each wheel (when single elliptic, with the smaller leaves downwards,) so placed as to act vertically upon the track, must be considered as another improvement not described in said specification.

The ends of such springs are set in pockets secured to the wheel-frame, whilst the middle of the spring rests upon the journal box. The use of the pedestal in connection with the double elliptic and the gum spring, is an important improvement also not described in said specification.

These are very important variations from Winans's specification.

Other improvements, such as check chains, safety beams, &c., might be named.

To the eighth interrogatory, he saith :

*Eighth.* The bodies of the eight-wheel cars now in common use, are so constructed as to be able to be removed from the truck whenever desired, by taking out the king-bolt, or in cases where the king-bolt is fixed in the car bolster, by lifting the car body so as to disengage the bolt.

The bolster of the trucks is usually placed at a distance of seven feet from the end of the framing of the body, or rather from the end of the platform.

To the ninth interrogatory, he saith :

*Ninth.* Such cars have side bearings, or check blocks, to prevent rocking.

To the tenth interrogatory, he saith :

*Tenth.* Check chains are in general use for passenger cars for the purpose of keeping the truck from turning, when, through some accident, it bolts the track.

To the eleventh interrogatory, he saith :

*Eleventh.* In my opinion, increasing or diminishing the length of the body of the said eight-wheel car, while the trucks are placed at the same distance from the ends of the body, does not introduce any new or different mechanical principles into the organization of the car; nor does such change require any exercise of invention.

To the twelfth interrogatory, he saith :

*Twelfth.* The axles of the wheels of a passenger car may be connected in the way described in said specification.

But such a mode I consider to be very objectionable. The springs, in the first place, would be very liable to get out of order. There could be but little reliance placed on the attachment of the two metal surfaces, (the ends of the springs and the upper sides of the boxes) and this attachment would be very deficient in durability. The leaves of the spring would be subjected to much too great a strain.

The action of the spring, moreover, would render such cars unsafe by its constant tendency, by destroying the parallelism of the axles, to bolt the track.

To the thirteenth interrogatory, he saith :

*Thirteenth.* The drawing does not show a car constructed with running gear, in the manner particularly described and recommended in said specification. The specification expressly describes a spring truck, each pair of wheels being connected together by a spring, the ends of which are secured to the upper sides of the boxes, the spring being placed with the longer leaves downwards.

The drawing exhibits a rigid rectangular wheel frame, having a spring for each wheel, secured by its middle to the journal box, and having its shorter leaves downward. The truck of the specification and that of the drawing, are entirely different.

To the fourteenth interrogatory, he saith :

*Fourteenth.* I have seen and examined the Repertory of Arts, Manufactures and Agriculture, Vol. 24, second series, published in London, A.D. 1814, more particularly that part of said volume which includes



the specifications and drawings of the patent of William and E. W. Chapman, or a true copy thereof.

To the fifteenth interrogatory, he saith :

*Fifteenth.* I have examined the model K, and said model does truly and correctly represent a railroad car or carriage, described and shown in said book and drawings.

To the sixteenth interrogatory, he saith :

*Sixteenth.* A car builder, of ordinary skill and knowledge of his profession, would be able, by aid of said specification and drawings, and without the necessity of exercising his own invention, to construct eight-wheel railroad cars, substantially the same as those now used by the Eastern Railroad, and other railroads generally, so far as respects the manner of arranging and connecting the eight wheels, and the connection of the trucks with the body of the cars.

To the seventeenth interrogatory, he saith :

*Seventeenth.* Said Chapman car, as shown in said book and drawings, has side-bearings and centre pivot, and rigid rectangular wheel frame.

To the eighteenth interrogatory, he saith :

*Eighteenth.* The distance between the bearing points of the wheels is about equal to the width of the track. I have measured the same.

To the nineteenth interrogatory, he saith :

*Nineteenth.* The model before me may be made to represent both the six and the eight-wheel carriage.

To the twentieth interrogatory, he saith :

*Twentieth.* I have examined a work called "A Practical Treatise on Railroads and Carriages," by Thomas Tredgold, published in London, England, in 1825, and the drawings therein referred to, or a true copy thereof. I have there found a drawing and description of a double-truck eight-wheel railroad car.

To the twenty-first interrogatory, he saith :

*Twenty-first.* The eight-wheel car, as described in said book, consists of two four-wheel trucks connected with the body of the car. The wheel-frames are rigid wheel-frames. The frames are united to the body of the car by a centre bearing, which allows the trucks to swivel to the road. The trucks are placed at a sufficient distance apart from each other to prevent their interference, while the swivelling pivot allows the trucks to turn to all the curves and irregularities of the road.

To the twenty-second interrogatory, he saith :

*Twenty-second.* I have examined model A. It is a correct representation of the said eight-wheel car of said Tredgold. It does not differ therefrom in any respect. I have examined model C. It is not a correct representation of said eight-wheel car of Tredgold, or of any car described by him. The wheel-frames are made fast to the body of the car, while the specification of Tredgold directs that that they shall be made to turn, and this turning must be upon the centre. I can't see where it can turn any other way.

To the twenty-third interrogatory, he saith :

*Twenty-third.* I have compared the eight-wheel car of said Tredgold with the eight-wheel cars used by the Eastern Railroad, and in general use in this country, so far as regards the running gear. In their mechanical principles and mode of operation they are substan-



tially identical. The cars now in use have side bearings, which are not shown in the model, and with this exception they are substantially identical.

To the twenty-fourth interrogatory, he saith :

*Twenty-fourth.* The said Tredgold car is calculated to answer the purposes and objects set forth in said Winans's specification, as designed to be accomplished by him.

To the twenty-fifth interrogatory, he saith :

*Twenty-fifth.* I have seen the letters patent of the United States, granted to Jonas P. Fairlamb, dated January 19th, 1833, and the drawings and specification thereof, or a true copy thereof. The principle of working on the centre pivot, claimed by Winans, in his specification, is shown by these drawings. Winans claims "a common waggon bolster, with a pin passing through;" and this drawing shows a circular plate instead of a bolster. I consider the principle the same.

To the twenty-sixth interrogatory, he saith :

*Twenty-sixth.* A mechanic of *ordinary* skill in car building, having knowledge of said Fairlamb's patent and drawings, would not, without exercising invention, be able to construct eight-wheel double-truck cars, substantially like those used by the Eastern Railroad, or like those in common use on the roads of the United States: but a man of theoretical as well as practical knowledge, might be enabled, from said drawings and specification, to construct such cars; and such cars, when constructed, would embody the essential principles of the eight-wheel car in common use, and would attain the beneficial results pretended to be obtained by said Winans, in his patent. The axles, however, should always be kept parallel.

To the twenty-seventh interrogatory, he saith :

*Twenty-seventh.* I have examined the model of the Allen steam carriage, marked Horatio Allen, now shown me by the Commissioner, and identified with my signature. The body of the car is carried by two trucks, each of which has four wheels, in a rigid wheel-frame. The truck-frame is united to the axles of the wheels by means of springs and pedestals. Each truck has a bolster running across the centre of the same, and there is an upper bolster, on which the body rests, by means of a large pivot or king-bolt, allowing the trucks to swivel freely to the curves and irregularities of the road. There are also side bearings upon each truck, to keep the car steady. It is calculated to attain the practical benefits of the eight-wheel railroad cars now in common use; and as to the construction and arrangement of the running gear, it is substantially the same. It also contains the construction and organization necessary to produce the beneficial results stated and claimed to be accomplished in said Winans's specification, of October 1, 1834. The arrangement allowing the car to swivel on the centre, and the four wheels in each truck, described by Winans, are embodied in this carriage. Winans has a single spring, while Allen's carriage has one to each wheel, giving greater steadiness of motion.

To the twenty-eighth interrogatory, he saith :

*Twenty-eighth.* I have examined the model of the eight-wheel double-truck railroad car now before me, marked "G. Bryant."

There are two four-wheel trucks, each truck resembling an ordinary

platform car. The two trucks are connected with the body of the car or bearing carriage, by a bolt or pivot. There is a bolster resting upon the platform, and a top bolster upon the bearing carriage. It has also side bearings upon the platform and bearing carriage.

The wheel-frames are perfectly rigid, and have side pieces and cross timbers. The wheels revolve on the axles. The distance apart from the bearing points of the wheels is a little greater than the width of the track.

In regard to its mode of operation, it is the same as the eight-wheel cars now in use, with the exception that in the model the wheels revolve *on* the axles, while in those now in use the wheels revolve *with* the axles.

It is adapted to pass all the irregularities and curves, as well as the straight track of the road.

It is constructed and operated upon the same mechanical principles with the cars used by the Eastern Railroad, and with those now in general use on the railroads of the United States.

The model of the Eastern Railroad car is not now shown me.

To the twenty-ninth interrogatory, he saith :

*Twenty-ninth.* The principle of the connection of the truck of the body of the car, by means of a king-bolt or swivel, as described by Winans, is embodied in the Quincy car.

To the thirtieth interrogatory, he saith :

*Thirtieth.* A mechanic of ordinary skill and knowledge in building railroad cars, having knowledge of the aforesaid Quincy car, in 1829 or 1830, would have been able at that time, without the exercise of invention of his own, to construct double-truck eight-wheel railroad cars, substantially like those now in general use, so far as regards the arrangement of the wheels and the connection of the trucks with the body of the cars.

To the thirty-first interrogatory, he saith :

*Thirty-first.* I have examined the treatise of Wood, published in 1825, the work of Tredgold, and that of Strickland, published in 1836.

The mode of drawing railroad cars by a coupling from the middle of the ends of the bodies, was well known, and publicly used and shown, and described in sundry printed works, prior to the year 1830.

To the thirty-second interrogatory, he saith :

*Thirty-second.* I have examined the last mentioned printed works. The distance of the bearing points of the wheels as compared with the width of the track, is the same, as a general rule ; there is but a slight difference between them, if any.

The best constructed cars now in general use, have the distance between the bearing points of the wheels about equal to the gauge of the track.

To the thirty-third interrogatory, he saith :

*Thirty-third.* Springs and pedestals as now used on the eight-wheel double-truck cars, were applied to the four-wheel cars described and shown in the American edition of Wood's Treatise, in 1832, and in said Allen's model.

To the thirty-fourth interrogatory, he saith :

*Thirty-fourth.* One mode of causing the wheels of a railroad car to revolve with the axles, was a well-known equivalent, prior to 1830, for

the mode of causing them to revolve on the axles ; and these equivalents are described and shown in the works before mentioned.

To the thirty-fifth interrogatory, he saith :

*Thirty-fifth.* In my opinion the substitution of axles revolving *with* the wheels for axles revolving *on* the wheels, is not an invention ; and it would not change the mechanical principles and operation of the car, so far as that is concerned. It would not, of course, affect any part of the car.

It would not, in my opinion, involve any change in the mechanical principles or modes of operation in said car, to substitute larger wheels instead of those used, so as to cause the flanges of the wheels on each truck to approach very near each other.

I think the change of draft from the truck to the body, would be a change of mechanical principle. When the draft is applied to the truck, it has not that freedom of motion as when applied to the body.

It would not be a change of principle to increase the length of the body of the platform ;

Or to place a box upon the top of the said platform, so as to become a passenger car ;

Or to cause it to run at any greater or less rate of speed ;

It would not, in my opinion, require invention to make any or all of these changes.

To the thirty-sixth interrogatory, he saith :

*Thirty-sixth.* In the construction and operation of the double-truck eight-wheel car, the distance of the flanges from each other, *of itself considered*, is not material.

The distance may be varied by increasing or diminishing the diameter of the wheels, without in any way changing the mechanical principles or mode of operation of the car containing them.

To the thirty-seventh interrogatory, he saith :

*Thirty-seventh.* The distance of the bearing points upon the rails, of the wheels in each truck, is material and essential to the operation of the cars. It adds greatly to the steadiness of the car when in motion.

To the thirty-eighth interrogatory, he saith :

*Thirty-eighth.* Maintaining the axles of the wheels in each truck, at a fixed and uniform distance from each other, is material and essential in the construction and operation of the eight-wheel car. It keeps the trucks on the track, and gives them more freedom of motion, and enables the cars to run more steadily.

To the thirty-ninth interrogatory, he saith :

*Thirty-ninth.* I do not know any other fact or circumstance, which, in my opinion, is pertinent to this issue.

To the fortieth interrogatory, he saith :

*Fortieth.* So far as the large spring is concerned, I think Winans's theory is incorrect, inasmuch as it does not keep the wheels parallel, there being no rigid wheel-frame to keep them so. I believe the other part, the swiveling motion, is correct. As to his wheels being placed close together, I think the theory wrong. The bearing points should not be placed so close together. Cars constructed according to his theory and specification, would, in my opinion, be unsafe as passenger cars. I form my opinion from actual experience. I have repaired the

cars containing these arrangements, and have built them; and I know from my own experience what I have before stated.

To the first cross-interrogatory, he saith :

*First X.* I have not had any experience in the construction, arrangement, or examination of machinery, other than is connected with passenger cars. I have been employed eighteen years in the construction of passenger cars, and during that time have paid particular attention to the machinery connected therewith. It was my duty to observe said machinery, and to see that it was properly arranged and in good order; and I consider myself from such experience a competent judge of such machinery.

To the second cross-interrogatory, he saith :

*Second X.* I have been and am particularly conversant with the construction of the running apparatus of railroad cars or carriages, and have paid considerable attention thereto, as I have described in my answer to the preceding interrogatory.

To the third cross-interrogatory, he saith :

*Third X.* I have never been examined as an expert in courts of justice in patent cases.

To the fourth cross-interrogatory, he saith :

*Fourth X.* I have not been accustomed to the examination and comparison of machinery with a view to forming or expressing or acting upon an opinion as to the substantial identity between two or more machines or combination of apparatus, other than railroad machinery. I have examined various kinds of trucks, wheels, and arrangement of running apparatus connected therewith, with a view to forming an opinion and acting thereon, before I knew of this case. It was part of my general duty during the whole time I have been engaged with the company. The subjects were, as I before stated, railroad machinery as adapted to passenger cars.

To the fifth cross-interrogatory, he saith :

*Fifth X.* I have stated that I was a foreman in the shop of the Baltimore and Ohio Railroad Company, and as such it was my duty and employment to attend to the construction and arrangement of the running gear of railroad cars and carriages.

To the sixth cross-interrogatory, he saith :

*Sixth X.* I do not consider myself an engineer, but I fully understand the principles involved in the construction and operation of railroad cars, of various kinds, and the properties essential to the proper operation under the present condition of railroad construction. I have such a knowledge of the subject as will enable me to compare the different construction of cars, and to judge therefrom whether they are practically adapted to answer the purposes required of railroad cars, under the conditions of high rates of speed, steadiness of movement, and the curvature and irregularities of the road, commonly found in the working of railroads in this country.

To the seventh cross-interrogatory, he saith :

*Seventh X.* It is my opinion, derived from experience, that it is important and essential to the proper operation of an eight-wheel car, that it should be able to move round curves in the road with the least practicable friction between the flanges of the wheels and the rails.



To the eighth cross-interrogatory, he saith :

*Eighth X.* The friction between the flanges of the wheels and the rails will be proportionate to the resistance which the wheels offer to the guidance of the rails.

To the ninth cross-interrogatory, he saith :

*Ninth X.* The wheels of a four-wheel car, or of a truck of an eight-wheel car, will not run upon a curve with less friction between the flanges and the rails, the nearer the axles of the wheels are to each other. The wheels being placed together makes them act more as one wheel, and in turning the curves or other irregularities of the road, they would be more likely to ride the rail than if placed farther apart.

There is, also, great lateral motion when the cars are going at a high rate of speed; and the wheels being placed so close together would make the car more liable to be thrown from the track, than if the bearing points were equal to the gauge of the track.

To the tenth cross-interrogatory, he saith :

*Tenth X.* The wheels of the trucks of an eight-wheel car will not, independently from other considerations, run upon the curve, and over the irregularities of the road, and yield to the guidance of the rails with least friction, when the trucks have the greatest freedom of motion. I think the distance between the bearing points, when equal to the width of the track, gives it as much motion as it requires, and enables it to run with more safety.

To the eleventh cross-interrogatory, he saith :

*Eleventh X.* I am not sufficiently acquainted, from personal knowledge, reading, or otherwise, with the state of railroad engineering, at and before the date of said Winans's patent, and particularly prior to 1830, to compare the present advanced state of railroad engineering with what then existed.

To the twelfth cross-interrogatory, he saith :

*Twelfth X.* It is, in my opinion, important and essential to the running of cars at high speeds, such as have been practised since the time of said Winans's invention, that they should be made in such a manner as to insure greater steadiness of motion than was attained by the four-wheel cars.

It is also my opinion that, making the car body of great length, say from forty to fifty feet, as compared with the modes before practised, and supporting the same at or near its ends, are essential to the attainment of greater steadiness of motion at high velocities, than could be obtained by the four-wheel cars as formerly constructed. The car body should not be made of greater length than I have described, on account of the unsteadiness incident to such great length. The trucks should be placed, at least, seven feet from the extreme end of the platform.

To the thirteenth cross-interrogatory, he saith :

*Thirteenth X.* It is, in my opinion, essential to the proper construction of an eight-wheel car, that it shall have the capacity to work with other cars in a long train, and in any part of the train in which it may be placed.

The middle car of the train always runs the steadiest.

To the fourteenth cross-interrogatory, he saith :

*Fourteenth X.* It is important and essential to the proper working of the first car in a train, that, while it is subjected to the whole draft of

the train, its trucks shall have the same freedom of motion that any other truck on the train has.

To the fifteenth cross-interrogatory, he saith :

*Fifteenth X.* It is essential to give freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them.

To the sixteenth cross-interrogatory, he saith :

*Sixteenth X.* The model B truly represents the car described in the Plaintiff's patent, in the extent of bearing surface between the bolsters.

The drawing is altogether different from the specification, and shows a greater extent of bearing surface than is therein described.

To the seventeenth cross-interrogatory, he saith :

*Seventeenth X.* The model B does not show the mode of attaching the draft, as is represented in the drawing of the Plaintiff's patent, nor is any described in the specification, so far as I can see.

To the eighteenth cross-interrogatory, he saith :

*Eighteenth X.* The Complainant describes a large spring with the larger plates down, and smaller plates on top ; he only describes the manner in which it is fastened to the top of the box, and, by securing a bolster across the top of the spring, forms the truck. This is the only mode of constructing a truck described by him ; and these he regards as an essential part of his invention.

To the nineteenth cross-interrogatory, he saith :

*Nineteenth X.* I consider the use of springs essential to the proper construction of an eight-wheel car.

To the twentieth cross-interrogatory, he saith :

*Twentieth X.* The description and drawings of the Chapman engine inquired of, represent a railroad car like model K. The language of the description is plain ; on page 139 :

" Fig. VIII shows a carriage of six wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels, are, as usual on railways, fixed to the body of the carriage ; 2, 2, and 3, 3, the other two pair, are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised as that two-thirds of its weight should lie over the central point of the four wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two-thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates *c, c*, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal wagon. And, if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equably upon both), and then similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway."

On page 130—" We also, as the carriage containing the motive power will, thus loaded, be too heavy in various cases for the strength of the existing iron or wooden rails, if resting on four wheels only, so arrange it for such ways (or other confined ways, where the ledges, either of the ways or of the wheels, regulate the direction of the car-

riage) that it may rest equably and move freely round curves or angles, either on six or eight wheels, so as to reduce its pressure on each, in the inverse proportion of its number of wheels. Having thus described the outlines of the separate leading parts of our invention, we shall proceed to the means of carrying them into effect."

Plate V, Fig. VIII, is a drawing of the *truck* referred to in said description.

To the twenty-first cross-interrogatory, he saith :

*Twenty-first.* In the drawings and description in the treatise by Tredgold, of a carriage with eight wheels, there is no representation or description of a draw-link, attached to the end of the body, as is shown in the model A. There is a description, however, of a draw-link, to the four-wheel cars, and a mechanic of ordinary skill could readily apply them to the eight-wheel car without invention.

To the twenty-second cross-interrogatory, he saith :

*Twenty-second X.* The drawing, Fig. 26, plate IV, is "a diagram, to show how a wagon may be made with eight wheels, so that the stress of each wheel, on the rails of a railroad, may be equal. The body of the wagon rests on the wheel-frames at AA, and is connected to them by an axis, on which the frames turn, when, from any inequality, the axes of the wheels are not in the same plane." This description is found on page 179. On page 94 :

"When a carriage has more than four wheels, the body must be sustained, so that its pressure may be divided equally among the wheels. In the case where eight wheels are applied to support one body, if the body rests upon the wheel-frame, of each set of four wheels, in the middle of its length, (see Fig. 26, Plate IV,) and is connected with those frames, so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure."

To the twenty-third cross-interrogatory, he saith :

*Twenty-third X.* The only thing I now perceive in the Allen carriage, claimed by Winans, is the centre pivot on which the trucks revolve.

To the twenty-fourth cross-interrogatory, he saith :

*Twenty-fourth X.* The Quincy car contains also the centre pivot, allowing the trucks to swivel. This is claimed by Winans in his specification.

To the twenty-fifth cross-interrogatory, he saith :

*Twenty-fifth X.* With my knowledge of what was the state of railroad engineering and science, in 1829 and 1830, a mechanic of ordinary skill, having all the knowledge possessed by the world at that time, about the construction of cars, would not have known what the requirements and characteristics of a railroad passenger car must have been, to enable it to move safely and smoothly over the curves and irregularities of a railroad, as then or now constructed, at the rate of thirty miles an hour, and to perform the duties required of the ordinary eight-wheel cars now in use.

To the twenty-sixth cross-interrogatory, he saith :

*Twenty-sixth X.* I consider the arrangement of railroad-car wheels fixed firmly to their axles and rotating with them, to be the same in principle, as those rotating loosely upon fixed axles.

To the twenty-seventh cross-interrogatory, he saith :

*Twenty seventh X.* I don't know where the draft was applied to the Quincy car, except as shown by the model, where it it applied to the truck.

To the twenty-eighth cross-interrogatory, he saith :

*Twenty-eighth X.* I think it essential that the draft should be applied to the body of the car, and not to the truck.

To the twenty-ninth cross-interrogatory, he saith :

*Twenty-ninth X.* The cars described in the works of Wood, Tredgold, and Strickland, referred to as having the draft applied to the middle of the ends of the body, were four-wheel cars, and the wheels were attached to the bodies. As I have before stated, the principle of drawing the four-wheel car by a chain-link, could be applied to the purpose of drawing an eight-wheel car, without any invention.

To the thirtieth cross-interrogatory, he saith :

*Thirtieth X.* In every instance that has come to my knowledge, as existing prior to the invention of the Complainant, in which eight wheels were employed, arranged in bearing carriages or trucks, to sustain an independent body, the draft has been represented as applied to the truck instead of the body, when any mode of applying the draft has been shown.

To the thirty-first cross-interrogatory, he saith :

*Thirty-first X.* The drawings and description of the "Chapman engine," referred to in the fourteenth direct interrogatory, nor the drawings or description in Tredgold's treatise, referred to in the twentieth direct interrogatory, nor the drawings or model of the Allen locomotive, referred to in the twenty-seventh direct interrogatory, nor the model of the Quincy car, would not, either or all of them, teach a mechanic of ordinary skill and knowledge in the construction of cars, in the year 1830, that placing the wheels of the trucks very near together would reduce the friction between the flanches of the wheels and the rails, over curves.

The wheels, I believe, were wider apart at that time.

To the thirty-second cross-interrogatory, he saith :

*Thirty-second X.* Such drawings and descriptions would not have taught a mechanic of ordinary skill and knowledge in the construction of cars, in the year 1830, that great stability of motion, when running at high velocities, could be attained by constructing the car body of great length, and supporting it at or near each end, upon two trucks thus constructed.

To the thirty-third cross-interrogatory, he saith :

*Thirty-third X.* The same drawings and descriptions would not have taught such a mechanic, in the year 1830, that in order to move over the curves and irregularities of a railroad at a high velocity, with safety and stability of motion, and with the least practicable friction on the rail, that the trucks should have the greatest possible freedom to conform to the surface of the rails, and should not be constrained by the draft.

To the thirty-fourth cross-interrogatory, he saith :

*Thirty-fourth X.* There is not, in the drawings and descriptions aforesaid, so far as I know, after an examination of the books referred to, any description of or allusion to, any arrangement or modification



in the construction of railroad cars, by which they might be run at high velocities, such as have been practised since 1830.

To the thirty-fifth cross-interrogatory, he saith :

*Thirty-fifth X.* The purpose shown and expressed in the drawings and descriptions before referred to, of the employment of eight wheels in a car or carriage, is solely for the purpose of carrying great weights, and dividing the weight equally on eight wheels, in order not to place a greater load on each wheel than they and the rails could well bear.

To the thirty-sixth cross-interrogatory, he saith :

*Thirty-sixth X.* I do not know whether such eight-wheel cars or carriages were employed previous to the year 1830, except to carry weights that could not be subdivided and carried upon four-wheel cars. My observation does not extend so far back as 1830.

To the thirty-seventh cross-interrogatory, he saith :

*Thirty-seventh X.* I have not been employed by any person or persons, corporation or corporations, to assist in the preparation of the defence of this case, or to collect evidence to impeach the validity of the patent of Ross Winans, in controversy in this suit. I am in no way connected with this case, excepting as a witness summoned to testify under the present commission; nor am I interested in any way in the result of this controversy.

To the thirty-eighth cross-interrogatory, he saith :

*Thirty-eighth X.* I am connected with the Baltimore and Ohio Railroad Company, as a working foreman in their car shop. Said Company uses eight-wheel passenger and freight cars on said road.

To the thirty-ninth cross-interrogatory, he saith :

*Thirty-ninth X.* I have formed an opinion that the letters patent of Ross Winans, now in controversy in this case, are invalid for want of novelty and originality. I have formed such an opinion after examining his specification. It has been the subject of conversation among many connected with railroads; but I have not had such conversations as will enable me to say with whom such conversations were held. It was the common talk that Winans had got a patent for an eight-wheel car; but I never saw his drawing or specification until recently. Conduce Gatch was spoken of as the inventor, and much surprise was manifested at Mr. Winans having the patent.

To the fortieth cross-interrogatory, he saith :

*Fortieth X.* I have not stated that I am a railroad superintendent. I am not a member of any association of railroad superintendents, or any committee thereof. I have not instructed or aided, or consulted with the counsel or solicitor for the defendants, in the preparation of the defence.

To the forty-first cross-interrogatory, he saith :

*Forty-first X.* I have not seen, heard, or had stated to me the substance of the foregoing interrogatories, or any of them, until propounded to me by the Commissioner.

To the first additional interrogatory, he saith :

*First.* The Baltimore and Ohio Railroad Company use the eight-wheel cars now in common use on railroads, with the knowledge of Mr. Winans, and without any objection or claim thereto on his part. I have understood so, but do not know it of my own knowledge.

To the second additional interrogatory, he saith :

*Second.* It would not, in my opinion, introduce any new mechanical principle, or any new mode of operation into the Chapman, Tredgold, Allen, or Quincy cars or carriages, if (instead of the bodies or platforms now shown or described) you should substitute longer bodies, retaining the same trucks or bearing carriages, and placing them under the body thus substituted, at the same distance from the respective ends thereof.

To the third additional interrogatory, he saith :

*Third.* It would not, in my opinion, require invention to make that substitution.

To the fourth additional interrogatory, he saith :

*Fourth.* The description and drawings of the Tredgold car or carriage, seem to regard it as essential that all the wheels should be equidistant from each other ; and if two trucks are placed remotely from each other under one body, by the substitution of a longer body, such remoteness of the trucks from each other would be inconsistent and incompatible with said description and drawings, and with the objects and purposes set forth by said Tredgold, in his said treatise.

To the fifth additional interrogatory, he saith :

*Fifth.* The Chapman car or carriage differs from Tredgold's. I think the principle of the running gear is more correct. It has side bearings and distributes the weight more evenly, and is better adapted to railroads. There is nothing in the description and drawings of said Chapman car, which renders it essential that all the wheels shall be equidistant from each other, and if two trucks are placed remotely from each other, under one body, by the substitution of a longer body, there is nothing in such remoteness of the trucks from each other, inconsistent or incompatible with said description or drawings, or with the objects and purposes set forth by said Chapman in his said specification.

To the sixth additional interrogatory, he saith :

*Sixth.* I make the same answer to this interrogatory as I did to the last, reference being now had to the Allen steam carriage.

To the seventh additional interrogatory, he saith :

*Seventh.* There is nothing in the said Quincy car (judging from the model thereof, and what I know of its structure and uses and mode of operation,) which renders it essential that all the wheels thereof should be equidistant from each other, under one body. The change of a longer instead of a shorter body (so that the same trucks should be coupled by the body remotely from each other, while the body should be supported at or near the two ends) would not be in any wise inconsistent or incompatible with the objects and purposes for which the Quincy car is designed and used.

To the eighth additional interrogatory, he saith :

*Eighth.* Winans's theory is to connect the wheels as close as they can be brought together, bringing the centre bearings as close as possible without their flanges touching ; these wheels are connected together by a large spring, the larger leaves downwards, the smaller leaves upwards, bolted to the top of the box, and a wagon bolster between the springs.

The mechanical theory of eight-wheel cars in present use, is to have a rigid wheel-frame ; the bearing points of the wheels about equal to

the gauge of the track, with springs and pedestals. They have the male and female transom plate, with a king-bolt connecting the two together, which allows them to swivel freely to the curve. They have the swinging bolster, the object of which is to keep the car straight to the track. The centre of the bolster is generally placed about seven feet from the extreme end of the platform. I regard such difference as essential.

To the ninth additional interrogatory, he saith :

*Ninth.* It is not necessary, in order to accomplish the purposes claimed and stated by Winans, to use or employ very long bodies. The result can be accomplished on short cars, if there is sufficient space to allow the trucks to swivel.

To the tenth additional interrogatory, he saith :

*Tenth.* I have answered the thirty-third cross-interrogatory in the negative. The trucks should not have the greatest possible freedom of motion. They should be so arranged as to keep them steady on the rails, and if the bearing points of the wheels be equal to the gauge of the track, sufficient freedom of motion will be given to enable them to keep the track and run with greater safety and less lateral motion, and have all that is required. When the wheels of the trucks are placed close together, according to Winans's specification, there is too much lateral motion, and the cars are unsteady; the trucks, too, are liable to bolt the track.

To the first additional cross-interrogatory, he saith :

*First X.* I consider Winans's theory to be: "The two wheels on either side of the carriages are to be placed very near to each other; the spaces between their flanges need be no greater than is necessary to prevent their contact with each other." "The two wheels on either side of one of the bearing carriages may, from their proximity, be considered as acting like a single wheel." The wheels are connected by a big spring, on each side, bolted on the top of the box resting on the axle, and bolsters with a king-bolt extending between the springs, to connect the body with the truck.

To the second additional cross-interrogatory, he saith :

*Second X.* I do not know what was the average rate of speed upon railways, prior to 1830.

I should say that railroads were principally used, prior to 1830, for carrying heavy freights. They were, however, used for the purpose of carrying passengers, though not to so great an extent as freight.

To the third additional cross-interrogatory, he saith :

*Third X.* I do not know in what manner railways were constructed, prior to 1830. I do not know whether or not they were constructed of such materials, and in such way, that distribution rather than concentration of the weight of the cars and of the locomotive, was required.

To the fourth additional cross-interrogatory, he saith :

*Fourth X.* I do not know whether there was more than one railway in England, prior to 1830, upon which passengers were habitually carried.

To the fifth additional cross-interrogatory, he saith :

*Fifth X.* The use to which railways, prior to that time, were habitu-

ally put, in the course of their regular business, was the transportation of trains of merchandise and passengers by horse power.

To the sixth additional cross-interrogatory, he saith:

*Sixth X.* The average speed was about ten miles an hour, prior to 1830.

To the seventh additional cross-interrogatory, he saith:

*Seventh X.* I have never designed railroad cars.

JACOB S. SHRYACK.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Com's.*

## DEPOSITION OF HENRY SCHULTZ.

DECEMBER 19, 1853. Henry Schultz, being duly sworn on the part of the Respondents, deposeth and says, as follows:

To the first interrogatory, he saith:

*First.* My name is Henry Schultz, aged about forty-six years. I reside in the City of Baltimore. I served my apprenticeship at house carpentering; my occupation for the last twenty years, has been repairing and building cars. I have been so engaged since the spring of 1832. In that year (1832) I was employed by the Baltimore and Ohio Railroad Company, and continued with them till 1837. During that time I was engaged in building cars for the company, with Jacob Rupp, who was contractor.

To the second interrogatory, he saith:

*Second.* I first worked at cars, in the spring of 1832, for the Baltimore and Ohio Railroad Company. I was employed under Conduce Gatch, who was then superintendent for the company.

To the third interrogatory, he saith:

*Third.* The first time I saw the "Columbus" was when she came down Charles Street, to take in passengers; she stopped at the ticket office, which was in the lower story of the building in which I worked. This was in the year 1832. She was running at the time I went there, in the spring; but I can't say how long she had then been running. She was employed in carrying passengers to and from Ellicott's Mills.

To the fourth interrogatory, he saith:

*Fourth.* The car "Columbus," had two four-wheel trucks, one under each end of the body; the bolster was about four feet from the end of the body; there were common boxes to the trucks. There were steps outside of the body of the car, also a baggage railing on top. The car which I then saw is fairly represented in model N, now before me. It seems to me, however, that there was a straight bolster instead of that now shown. The car was subsequently altered by putting the steps inside; the baggage rods were made higher; an awning was fitted, and a wire work was placed round the top. The alterations were made in the summer of 1832—warm weather; and passengers were then carried on the outside. There was a kind of hatchway placed on top, to keep the rain out of the car, at the same time the other alterations were made.



Model N is a correct model, except, as I have before stated, that I think the car had a straight bolster, instead of that shown in the model.

To the fifth interrogatory, he saith :

*Fifth.* I do not know of any alterations to the Columbus, other than those I have mentioned in my answer to the preceding interrogatory.

To the sixth interrogatory, he saith :

*Sixth.* There were other eight-wheel cars than the Columbus on the road and in the yard of the shop. There were two platform cars, of four wheels each, one at each end, two long spring-pieces, with a bolster near the end, with four uprights, two at each end.

A king-bolt ran through the centre of the bolster, connecting the platform to the body by means thereof. They were used to haul wood. I can't say how many I saw. I saw them on the road and about the shop. Some were brought to the shop to have standards put on.

Model M is a correct model of said eight-wheel wood car.

To the seventh interrogatory, he saith :

*Seventh.* Conduce Gatch had the credit of originating the eight-wheel cars. He superintended their construction from time to time.

To the eighth interrogatory, he saith :

*Eighth.* Jacob Rupp, Washington Frost, John Rupp, Leonard Forrest, John Eichelburg, Zela Cole, Edward May, Oliver Cromwell, George Bartlett, and others, whose names I cannot now remember, worked in the shop in Charles street, when I went there.

To the ninth interrogatory, he saith :

*Ninth.* Conduce Gatch superintended the work there.

To the tenth interrogatory, he saith :

*Tenth.* There were two other eight-wheel passenger cars built at the Charles street shop. I don't remember their names. One of them had five coach bodies upon two trucks, of four wheels each, one body being elevated at each end, and the three sinking in the centre, resting on a frame; and the other had three coach bodies upon two trucks, of four wheels each; the trucks being placed about four feet from the end of the body. The running gear was the same in principle with the model of the Columbus now before me. They were built in 1833 and '34. The bodies were built by Oliver Cromwell, and the trucks by Conduce Gatch.

To the eleventh interrogatory, he saith :

*Eleventh.* A contract was made, in October, 1834, between Jacob Rupp, of the one part, and George Gillingham, on behalf of the Baltimore and Ohio Railroad Company, of the other part. When the contract was made, Rupp requested me to go in with him as a partner. I did so. One hundred and ten eight-wheel cars were contracted for, and were furnished. They were freight cars; house cars we generally call them.

To the twelfth interrogatory, he saith :

*Twelfth.* The building of these cars was commenced in December, 1834, and the first money was drawn in January, 1835.

To the thirteenth interrogatory, he saith :

*Thirteenth.* We had some bodies put together and set up in the yard, waiting for the iron work. There was a great delay caused by waiting for it. While these bodies were in the yard, Mr. Rupp and myself had some conversation about the mode of coupling the cars together. Mr.

Rupp suggested to me, as he said he had before suggested to Mr. Gillingham, that we should bolt pieces on the front of the car, from one side to the other, and connect the cars together by means of a coupling pin, at the middle of the end of the body. It struck me at once that this was the best thing that could be done, and upon the consent of Mr. Gillingham being obtained, they were thus constructed. This conversation was in March, 1835.

To the fourteenth interrogatory, he saith :

*Fourteenth.* Some of the bodies were furnished and waiting for iron work, such as springs and wheels ; they had the mode of drawing attached, as I have described in my answer to the last interrogatory.

To the fifteenth interrogatory, he saith :

*Fifteenth.* The house or freight cars to which I have referred, were the first cars that drew by a coupling from the middle of the end of the body, to the best of my recollection ; there were none on that road before.

To the sixteenth interrogatory, he saith :

*Sixteenth.* Jacob Rupp and myself built the first frame for the car body to be set upon, for the Washington cars ; they were being built at the same time with the cars for the Baltimore and Ohio Railroad. This frame was built in the fall of 1835. These cars drew by the middle of the end of the body. I can't tell what year they were finished in.

To the seventeenth interrogatory, he saith :

*Seventeenth.* All the eight-wheel cars afterwards built drew by a coupling from the middle of the end of the body. We finished our contract in the fall of 1836. We made one hundred and ten eight-wheel cars under said contract.

To the eighteenth interrogatory, he saith :

*Eighteenth.* The cars we built under the contract were eight-wheel cars, two trucks, one at each end of the car, with cast iron bolsters, about four and a half feet from the end of the body of the car. It had steel springs set in pockets at each end, with the longer leaves upwards and smaller leaves downwards. There were brakes at both ends. The contract was to put the brake at one end, but that was subsequently changed to a brake on both ends. The weather boarding was outside, and the roof was a double pitched roof shingled. The length of these cars was twenty-four feet. They had, as I before stated, cast iron bolster, with a wrought iron king-bolt, let down through both bolsters. The coupling was from the middle of the ends of the body ; the cars had a rigid wheel-frame to keep the wheels square and steady ; the flanges of the wheels were about six inches apart, with a brake between.

The drawing attached to the commission does not represent the freight cars thus constructed. It represents a car I saw on the Baltimore and Ohio Railroad, in 1837 or 1838, when I was employed by the Philadelphia, Wilmington and Baltimore Railroad Company. These cars must have been made in 1837 or 1838, because they were not made when I worked for the Company ; and in either 1837 or 1838 they were first put on that road ; they were new when I saw them.

To the nineteenth interrogatory, he saith :

*Nineteenth.* I engaged with the Philadelphia, Wilmington and Baltimore Railroad Company, in 1837, at Baltimore. My duty in that com-

pany was as superintendent of repairs, and building cars. I built all the eight-wheel cars, with one or two exceptions, running between the Susquehanna River and Baltimore.

To the twentieth interrogatory, he saith :

*Twentieth.* The eight-wheel passenger cars built by me, on the Philadelphia, Wilmington and Baltimore Railroad, have a rigid wheel frame under each end of the car; they have swinging bolsters and draw springs. The cars average about forty-four feet in length. The trucks have male and female transom plates to swivel in; there is a king-bolt passing through, to connect them to the body. They have side bearings to prevent the lateral motion. The centre of the bolster is about seven feet from the end of the platform, and about four-and-a-half feet from the end of the body. The bearing points of the wheels are about equal to the width of the track, enabling the cars to run more steadily.

They have, also, steel springs, with chilled bearings, safety-beams; all which I consider essential in their construction and principle.

To the twenty-first interrogatory, he saith :

*Twenty-first.* I have answered that the distance between the bearing points of the wheels is about equal to the gauge of the track, and that the distance of the centre of the bolster is about seven feet from the end of the platform, or about four-and-a-half from the end of the body. The centre bearings of the wheels of the car "Columbus," were much closer than I have described. The bolster was about four feet from the end of the body.

To the twenty-second interrogatory, he saith :

*Twenty-second.* I have examined and do understand the specification of Ross Winans's patent, of Oct. 1, 1834.

To the twenty-third interrogatory, he saith :

*Twenty-third.* I have examined model B, now shown me by the Commissioners; it is a true representation of the car described and recommended in said specification; it does not differ in any respect therefrom.

To the twenty-fourth interrogatory, he saith :

*Twenty-fourth.* A car constructed according to Ross Winans's specification, will not be practically useful. I should think that, placing the wheels too close together, would produce great friction in turning the curves, and would produce too much lateral motion on the road; the wheels would be liable to be thrown oblique to the track. The wheels being connected by a single spring is unsafe.

The increased friction would cause the rail and the flanges of the wheels to wear away in greater proportion than is now done.

To the twenty-fifth interrogatory, he saith :

*Twenty-fifth.* The essential points of the construction of the eight-wheel car, as built by me, and in general use, are, having a rigid rectangular wheel frame, with four wheels in each frame; the bearing points of the wheels about equal to the gauge of the track, with springs, the longer leaves upwards, the ends to be fastened in pockets. Transom plates and king-bolts connecting the body to the trucks; side bearings to prevent too much lateral motion, and safety beams. Such points of construction and action are vital, in my opinion, to their safety and good operation.



To the first cross-interrogatory, he saith :

*First X.* There is no point of draft indicated in model B, nor is any shown or described in Mr. Winans's specification.

To the second cross-interrogatory, he saith :

*Second X.* The drawing shows a bearing surface between the upper and lower bolster. It shows side bearings and centre bearings, while the specification describes centre bearings only. Model B shows only a centre bearing.

To the third cross-interrogatory, he saith :

*Third X.* The copy of Winans's patent, examined by me, in pursuance of the twenty-second direct interrogatory, was that annexed to the commission. It has a drawing attached.

To the fourth cross-interrogatory, he saith :

*Fourth X.* A car constructed upon the plan suggested in Winans's specification, will not be useful, as I have described in my answer to the said twenty-fourth direct interrogatory. I saw a car constructed on Winans's plan, in use on the Baltimore and Ohio Railroad ; and after trial it was condemned, as being too liable to accident.

To the fifth cross-interrogatory, he saith :

*Fifth X.* In the cars now built by me there are two independent swivel trucks, under the extremities of a long car body ; the cars have the point of draft at the end of the body. The length of the passenger cars is about forty-four feet. The truck-frames are seven-and-a-half feet long, six feet and five inches wide. The wheels are thirty-two inches in diameter ; the distance apart of the axles of the truck is nearly equal to the width of the track.

To the sixth cross-interrogatory, he saith :

*Sixth X.* I have no license to build such cars other than the authority of the Philadelphia, Wilmington and Baltimore Railroad Company.

To the seventh cross-interrogatory, he saith :

*Seventh X.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, or any of them, prior to this examination.

HENRY SHULTZ.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Comr's.*

## DEPOSITION OF EDWARD GILLINGHAM.

DECEMBER 12, 1853. Edward Gillingham, being duly affirmed, on the part of the Respondents, deposest and says, as follows :

To the first interrogatory, he saith :

*First.* My name is Edward Gillingham, aged thirty-nine years, residence Baltimore city, business or occupation is clerk in the machinery department of Baltimore and Ohio Railroad Co.

To the second interrogatory, he saith :

*Second.* I was connected with my father in the manufacture of railroad machinery, from 1829 and '30 to 1837. I was connected with him as an assistant, in purchasing material, and attending to the shops in his absence. I have been connected with railroads, more or less, since 1829.

To the third interrogatory, he saith :



*Third.* My father's name was George Gillingham; he is dead; he died in 1840, February 23d. He was connected with the Baltimore and Ohio Railroad, and in the manufacture of railroad machinery. He was connected with that road until within three years of his death. He was superintendent of the general machinery of the road. When he left the company, he went into the business of manufacturing railroad machinery, on his own account—principally chilled wheels. His shops were in Gillingham alley. He was in this business until within eighteen months of his death.

To the fourth interrogatory, he saith:

*Fourth.* I assisted my father by purchasing the material, superintending the shop in his absence. I kept the time of the hands, and was superintendent in my father's absence. The shops were in Gillingham's alley. I had opportunities every day, of seeing the progress of the railroad and railroad cars. I saw the cars as they were being built at Mount Clare, a depot of the Baltimore and Ohio Railroad, and when they were finished I saw them every day at the Mount Clare depot.

To the fifth interrogatory, he saith:

*Fifth.* I saw trussel cars on the Baltimore and Ohio Railroad, with more than four wheels, in 1830. They had eight wheels. They were under the superintendence of and were gotten up by Conduce Gatch.

There were two four-wheel trucks, at that time called "flats," with string-pieces bolted to a bolster; also uprights attached to each end of the string pieces, to prevent the cord wood from falling off. These uprights could be taken out at any time. The frames were connected to the trucks by body pins, as they were called then, but king-bolts now, allowing the truck to swivel to the curves. There were also boxes for the journals of the axles. They were called a common box pattern. I also saw the first idea given of the common eight-wheel car. It was constructed from two ordinary four-wheel trucks, connected by a pole cut from the woods. This pole was attached to the trucks by pins passing through holes near the ends of the pole, and through the centres of the trucks. It was used to convey long timbers to Mount Clare from the neighboring timber grounds. The model annexed, marked M, and identified with my signature, is a correct representation of the trussel cars on the Baltimore and Ohio Railroad referred to.

To the sixth interrogatory, he saith:

*Sixth.* My father was a manufacturer of car iron work, in 1829. I include by the term car iron work, the running gear of cars. In 1831, I think in the fall of the year, he became superintendent of the machinery of the Baltimore and Ohio Railroad. In both these capacities he superintended the getting up of eight-wheel cars.

I remember my father's doing the iron work of the first trussel car used on that road. This was in the fall of 1830. Conduce Gatch made the wood-work of said car.

To the seventh interrogatory, he saith:

*Seventh.* I do recollect an eight-wheel car used to carry passengers on the Baltimore and Ohio Railroad. I recollect a number of such cars. The one which I first saw on that road was constructed in the early part of 1831. It was called the Columbus, and she made her first trip on the fourth of July, 1831. I rode in that car, but not on that

day. I saw her, however, used on the day named. She was commenced in the early part of 1831, and finished before the fourth of July.

To the eighth interrogatory, he saith :

*Eighth.* I cannot say positively under whose direction the said eight-wheel passenger car was built. But Gatch, at that time, had the superintendence of the shops, and she must have been built under his superintendence.

To the ninth interrogatory, he saith :

*Ninth.* The eight-wheel passenger car referred to, had two four-wheel trucks; these were connected by centre-pins or king-bolts, with the body of the car. These pins passed through bolsters crossing the middle of the trucks, and through cross-bolsters of the car body. On each truck-bolster, on either side of the centre-pin or king-bolt, were bearing rollers, on which rested a circular bearing plate attached to the bolster of the car body, on which the truck swiveled. Attached to the truck, and projecting for the purposes of draft, were three pieces, resembling and acting as the hounds of a waggon.

There were common journal-boxes used on the Columbus, and attached to the wheel-frames by bolts.

The model annexed, marked N, and identified with my signature, is a correct representation of the car Columbus referred to.

To the tenth interrogatory, he saith :

*Tenth.* My father superintended the making of boxes for railroad cars. He had them cast. I have carried the patterns to the foundry myself.

They were cast at Barker's foundry, in Baltimore, in 1831. They were made for different cars—the car Columbus among others. They were common journal boxes, attached to the wheel-frame by bolts, and are correctly represented on the model N, referred to in my answer to the last interrogatory.

In 1832, alterations were made in the boxes of the Columbus car. Ross Winans's friction boxes were substituted for the plain or common boxes, which I have described. These boxes were fitted up at my father's shop, Gillingham's alley, north of Pratt street, entrance on Howard street, Baltimore. I was in my father's shop at that time. George M. Lowry fitted them up. An awning was also placed on the car, and a wire net-work around the top of the car.

To the eleventh interrogatory, he saith :

*Eleventh.* I know Ross Winans, the Plaintiff, and have known him since the year 1829. He has been engaged in the manufacture of locomotive engines, near Mount Clare, in Baltimore, since 1839, or thereabouts.

To the twelfth interrogatory, he saith :

*Twelfth.* I do not know any other matter or thing of advantage to the Respondent, in this case.

EDWARD GILLINGHAM.

CHAS. HEAZLITT, }  
ROBT. P. KANE, } *Com'rs.*

## DEPOSITION OF EDWARD MAY.

DECEMBER 12, 1853. Edward May, being duly sworn on the part of the Respondent, deposeth and says, as follows :

To the first interrogatory, he saith :

*First.* My name is Edward May, aged forty-six years; residence, Baltimore city; present business, hardware dealer. I formerly followed the carpentering business. I am a carpenter by trade.

To the second interrogatory, he saith :

*Second.* In the fall of 1831, I worked for the Baltimore and Ohio Railroad Company. The first thing I did when I went to them, was to prepare the old warehouse at the corner of Charles and Campbell Streets, for a work shop in which to build cars. When it was finished, which was in the summer or fall of 1831, I went to work upon car-trucks of four-wheels.

To the third interrogatory, he saith :

*Third.* A track was laid from the Charles Street shop, I think in 1832; it might have been in 1831; I am not positive as to dates; it was, I think, either in the latter part of 1831, or early part of 1832. It led to the main road on Pratt Street.

To the fourth interrogatory, he saith :

*Fourth.* Soon after said track was laid, I saw railroad cars upon it. I am certain I saw them in 1832, and if the track was laid in 1831, the cars came upon it soon after the track was laid. I was at work on the road, and could not help seeing them. I saw them all as I came in. Some were brought there to be altered into eight-wheel cars; others to be repaired. Those to be altered were changed into the eight-wheel cars. The appearance of these cars closely resembled the model M, with the exception of the platform. They were intended to carry wood, and there was no necessity for it, when used for that purpose. There were other cars of eight wheels made to carry stock in; they were, however, on the same principle as model M. There were standards in the wood cars, the same as shown in the model; they could be taken off, and a frame or box put upon the trucks, making them similar to the stock car I have mentioned. I always understood Mr. Conduce Gatch to be the inventor of them, but I never considered there was much invention in them. It grew out of the necessity of the case. The trucks were two common trucks of four wheels each, with a timber running through, connecting the two trucks. They had bolsters and a bolt going through the centre, allowing the trucks to swivel to the curves of the road. Model M is a correct model of said car, with the exception of the platform I have mentioned.

To the fifth interrogatory, he saith :

*Fifth.* I can't say how many of said eight-wheel cars were running on said road in the spring of 1832. There were from fifteen to twenty, I should judge. They were in common use on that road. I can't say how long they had been on the road before I saw them on the branch; but, from their appearance, I should suppose a year or so. Some were newer than others. The only means I have of judging was from the appearance of them. They were built mostly at Mount Clare shop, and my business was confined to the Charles street shop.

To the sixth interrogatory, he saith :

*Sixth.* I never heard, at any time prior to the fall of 1851, that Ross Winans claimed to be the inventor of the eight-wheel double-truck railroad car.

To the seventh interrogatory, he saith :

*Seventh.* There were eight-wheel passenger cars upon said road in the spring of 1832 and 1833. They were the same in principle of construction and operation as the wood and freight car first described by me, as seen on said road.

To the eighth interrogatory, he saith :

*Eighth.* Some of the eight-wheel passenger cars were built at the Charles street shop, I think in 1832.

The car Columbus was built at the Mount Clare shop, in 1831.

To the ninth interrogatory, he saith :

*Ninth.* I am not positive whether or not I built any eight-wheel burthen cars, unless the stock cars I have before described be considered as burthen cars. Then I say that I have built such cars, the trucks of which were arranged upon the same principle of construction as model M. They operated well ; there was no objection to them, and they seemed to answer all the purposes for which they were designed. They were used for carrying stock and other articles of freight.

To the tenth interrogatory, he saith :

*Tenth.* Timber cars were in use at that time. I saw them in the winter of 1831, or spring of 1832, and were used and constructed as I have before described.

To the eleventh interrogatory, he saith :

*Eleventh.* I recollect the car Columbus ; the names of the others I don't remember. I saw these and other cars, which were afterwards put upon the Baltimore and Ohio Railroad, and the cars now in general use upon railroads. There is not any substantial difference in the construction and operation of said cars, from the construction and operation of said wood and freight cars, so far as relates to the running part and connection of the running part with the body of the platform.

To the twelfth interrogatory, he saith :

*Twelfth.* I know Conduce Gatch. I have been acquainted with him for twenty odd years. I have always considered him an ingenious man. He was always making improvements and alterations, and I have always regarded him as the inventor of the eight-wheel car referred to.

To the thirteenth interrogatory, he saith :

*Thirteenth.* I do not know any other matter or thing of advantage to the Respondent in this case.

To the first cross-interrogatory, he saith :

*First.* I consider the principle of the eight-wheel car in common use to be as follows : Getting a long length of body, supported on two four-wheel trucks, with bolster pins passing through the bodies and trucks, so that the trucks turn with the curves of the road, the bolsters working round the pins.

To the second cross-interrogatory, he saith :

*Second.* I have not studied engineering nor scientific mechanics, excepting so far as connected with building, architecture, &c.

EDWARD MAY.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Com'rs.*



## DEPOSITION OF JOHN RUPP.

DECEMBER 15, 1853. John Rupp, being duly sworn on the part of the Respondents, deposeth and saith as follows:

To the first interrogatory, he saith:

*First.* My name is John Rupp, aged about 44 years. I reside in Hanover, York County, Pennsylvania, and am a cabinet maker by business.

To the second interrogatory, he saith:

*Second.* I was in the employ of the Baltimore and Ohio Railroad Company, in 1831. I commenced about the middle or latter part of April of that year. I worked at first on four-wheel cars.

To the third interrogatory, he saith:

*Third.* I worked on the car Columbus while she was being built, in the early part of the summer of 1831. I made the sash and doors of the Columbus in the early part of the summer of 1831. I left the shop at Mount Clare in the fall of 1831. From there I went to the shop at the corner of Charles and Camden Streets, where I remained till the spring of 1832, at which time I removed to Hanover, my present residence.

To the fourth interrogatory, he saith:

*Fourth.* When I worked at the Mount Clare shop, I saw eight-wheel double-truck wood cars pass that shop; that was in the summer of 1831. I was working, as I have stated, when I saw them. I don't recollect how many I saw, but I saw them frequently, both in motion and standing upon the track, where they were frequently put.

To the fifth interrogatory, he saith:

*Fifth.* They were constructed upon the same principle as the car Columbus, before referred to.

To the sixth interrogatory, he saith:

*Sixth.* Those eight-wheel wood cars were used for hauling wood when I saw them.

To the seventh interrogatory, he saith:

*Seventh.* There were two four-wheel trucks, each of which turned on a centre pivot. There were bolsters on the truck-frames, containing the standards or upright pieces; and the model M, now before me, is a true representation of said wood cars, as near as I can now recollect.

To the eighth interrogatory, he saith:

*Eighth.* When I first saw the said eight-wheel wood cars, they were laden with wood, and their appearance was that of two four-wheel trucks, held by the frame on top and connected by a king-bolt, which allowed the trucks to swivel to the short curves of the road.

To the ninth interrogatory, he saith:

*Ninth.* I do not recollect doing anything to any one of these eight-wheel wood cars, while I was at work at the Saint Clare shop.

To the tenth interrogatory, he saith:

*Tenth.* I always thought that Mr. Conduce Gatch was the inventor of the Columbus. I never heard Mr. Gatch say that he was the inventor, but when the car was finished, all the mechanics at the shop went out with the car on the Saturday afternoon preceding the 4th of

July, 1831. Mr. Gatch went along, and on our return to the Mount Clare depot, he said that he could make further improvements on the car by putting India rubber between the two bolsters. From what Mr. Gatch then said, I thought he was the inventor, and I never supposed that he was not.

To the eleventh interrogatory, he saith :

*Eleventh.* I never saw any drawing of the car Columbus in the possession of Oliver Cromwell.

To the twelfth interrogatory, he saith :

*Twelfth.* I think my brother, Jacob Rupp and Mr. Gatch's brother worked on the trucks of the Columbus about the same time I worked upon her. I don't now remember who else worked upon her. Washington Frost, Michael Glenn, and others, whose names I don't recollect, worked in the shop at that time.

To the thirteenth interrogatory, he saith :

*Thirteenth.* I do not recollect hearing Ross Winans giving any directions about building the car Columbus. I was in a position or situation to have known or heard them, if any directions had been given to those who were at work on the iron work ; that is to say, if such directions had been given in our shop, where the running part was made, I would have known it.

To the fourteenth interrogatory, he saith :

*Fourteenth.* The model of the car Columbus, now shown me, and identified with my signature, is a true and correct model of the said car, as she was actually built and first put upon the road, to the best of my recollection.

The Columbus was an eight-wheel car, built for carrying passengers ; there were two trucks which were arranged upon the same principle as shown in the eight-wheel wood car before alluded to.

To the fifteenth interrogatory, he saith :

*Fifteenth.* I don't know any other matter or thing of advantage to the Defendant.

To the first cross-interrogatory, he saith :

*First X.* I can't state precisely the day of the month that I entered into the service of the Baltimore and Ohio Railroad Company. It was either the middle or latter part of April, 1831. I can fix this date only by direction. I remember being paid about the 1st of May, 1831, for the work I performed in April. It was the first money I ever drew in Baltimore in wages, and I shall always remember it.

To the second cross-interrogatory, he saith :

*Second X.* The eight-wheel wood cars which I saw in 1831 were drawn by the truck.

To the third cross-interrogatory, he saith :

*Third X.* These eight-wheel wood cars were composed of two ordinary four-wheel platforms, and were connected together, as I have before described, in my answer to the eighth direct interrogatory.

To the fourth cross-interrogatory, he saith :

*Fourth X.* I understood Conduce Gatch invented the car Columbus ; he was our foreman ; he gave us directions, and we did whatever he directed. I have before given my reasons for supposing him to be the inventor, in my answer to the tenth direct interrogatory.

To the fifth cross-interrogatory, he saith :

*Fifth X.* I don't know what the duties of Ross Winans were about the shops of the company, while I was in their service. In the fall of 1831 Mr. Winans gave me instructions about a brake to work between the two wheels of a four-wheel car, with a lever to the brake on the platform. This is the only instruction I ever heard him give.

To the sixth cross-interrogatory, he saith :

*Sixth X.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, prior to my present examination.

JOHN RUPP.

CHAS. F. HEAZLITT, }  
ROBERT P. KANE, } *Comr's.*

## DEPOSITION OF WILLIAM E. RUTTER.

DECEMBER 3, 1853. William E. Rutter, being duly sworn on the part of the Respondents, deposeth and says as follows :

To the first interrogatory, he saith :

*First.* My name is William E. Rutter; aged forty-three years; place of business and residence in Elmira, New York. My business is that of a coach maker.

To the second interrogatory, he saith :

*Second.* I learned my trade in the city of Baltimore, with Buddy and Colvin, from April, 1828, to 1832.

To the third interrogatory, he saith :

*Third.* I was present at the commencement of the Baltimore and Ohio Railroad. I was one of the postillions of Charles Carroll, of Carrollton, when the corner stone was laid, on the 4th July, 1828. Buddy and Colvin furnished the carriages and horses, and I was directed by Mr. Buddy to go as postillion. Among others present were Capt. Wm. Gibson M'Neal, Charles Carroll, of Carrollton, William Ensey, a merchant, Lot Ensey, Mr. Buddy, Mr. Colvin, and a procession of coach makers, among whom were Conduce Gatch, W. O. Frost, and several others. Of course there were many others present whose names I cannot now remember. The corner stone of the road was laid, as I have before stated, on the 4th of July, 1828.

To the fourth interrogatory, he saith :

*Fourth.* I saw eight-wheel railroad cars in use on said road in 1830. I think November. I know it was in the winter, some time; they were used for carrying wood. They were the first I ever saw.

To the fifth interrogatory, he saith :

*Fifth.* I saw the car "Columbus," when she was first commenced. I think she was commenced in 1832. I saw her being built at the depot of the Baltimore and Ohio Railroad Company, who were building her under the direction of Mr. Gatch; he had charge of the business. The eight-wheel wood cars I have before spoken of were in operation before the "Columbus" was commenced.

To the sixth interrogatory, he saith :

*Sixth.* There was an alteration made in the car "Columbus," after she was first built and put in operation. There was a stairway put from the inside to the roof. Posts were raised high enough for a cover

to be put over the roof, on which seats were placed. These are all the alterations I now recollect. I think these alterations were made in 1833.

To the seventh interrogatory, he saith :

*Seventh.* I am well acquainted with Oliver Cromwell, Leonard Forrest, Jacob Rupp, Francis Gatch, George Miller, Conduce Gatch, John Rupp, Michael Glenn, and Washington O. Frost. Conduce Gatch had charge of the St. Clair shop.

To the eighth interrogatory, he saith :

*Eighth.* I can't say how many eight-wheel cars were in operation before the "Columbus" was commenced. There were a number of the eight-wheel wood cars, but I can't say how many.

To the ninth interrogatory, he saith :

*Ninth.* These cars had two four-wheel trucks, rigid wheel-frames, and bolster-pieces extending across, on which rested the upper bolster of the body. There was a centre pivot or king-bolt, passing through the bolster at the centre of the truck ; and the frame of the car consisted of long framing pieces bolted to the upper bolsters. The trucks swiveled to the curves and irregularities of the road. The wheels in the truck were, I should think, some seven or eight inches apart. It was calculated, in those days, to place the wheels as close together as possible, so as to enable them to run around the curves. These cars operated on the road very well, and were considered an improvement. The model M is a true model of the said eight-wheel wood car, in all its particulars, as near as I can recollect. I have identified the model with my signature.

To the tenth interrogatory, he saith :

*Tenth.* I never knew who invented the eight-wheel cars I have described. I supposed it was an idea of Conduce Gatch's, but I never considered it an invention. I considered it as merely placing two four-wheel trucks a greater distance than usual apart. It was not considered an invention ; it was merely considered an improvement.

To the eleventh interrogatory, he saith :

*Eleventh.* I don't know who invented the car "Columbus," but I always supposed it to be Oliver Cromwell's idea ; he had charge, and gave directions as to the work. He was considered an excellent workman.

To the twelfth interrogatory, he saith :

*Twelfth.* I think I left Buddy and Colvin in 1832. I was there four years and three months. From there I went to Boston, in company with W. O. Frost. We were both employed on the Boston and Providence road, by Capt. McNeal. I resided in Boston. I returned to Baltimore in March, 1833, merely on a visit to see my friends. I remained there a few days, during which I went to the railroad depot, and there saw Gatch and Cromwell at work, building eight-wheel cars.

To the thirteenth interrogatory, he saith :

*Thirteenth.* The model N is a true model of the car "Columbus," as it existed before the alterations I have mentioned were made to it. I identify it with my signature.

To the fourteenth interrogatory, he saith :

*Fourteenth.* When I returned in 1833, they were building cars with drop centres, which were then considered an improvement. The car



was divided into three apartments; the entrance was at the side. The running gear was constructed on the same principle as I have described. There was a number of cars being built upon this plan, but I cannot remember how many.

To the fifteenth interrogatory, he saith:

*Fifteenth.* I do not know of any other matter or thing, that may be of benefit to the Respondent, in this case.

To the first cross-interrogatory, he saith:

*First X.* I don't know who invented the car "Columbus," nor the eight-wheel railroad wood cars, I have referred to. I did n't suppose, at that time, it was any invention at all. I thought it was merely an improvement.

To the second cross-interrogatory, he saith:

*Second X.* I saw the eight-wheel wood cars in use on the Baltimore and Ohio Railroad before I saw the "Columbus." I remember it distinctly, because my uncle, William Ensey, living down by the Three Tun Tavern, and the cars coming near him. I was there frequently and saw them. The peculiarity of the cars, being so long, longer than I had seen, attracted my attention, and I made inquiry of Gatch and others as to whether it was a temporary arrangement or an improvement. Gatch said it was an improvement. He talked then of building passenger cars at that time (1830), upon the same principle.

To the third cross-interrogatory, he saith:

*Third X.* I had nothing to do with the construction of the Columbus, or of the wood cars. I cannot tell the length of the car Columbus, nor its breadth, nor the size of her wheel, but the diameter of the wheel used at that time was about thirty inches. I can't say how far the wheels were apart. The car was drawn by the truck, as shown in the model. I thought it a very long car when I saw it.

To the fourth cross-interrogatory, he saith:

*Fourth X.* The said wood cars were composed of two four-wheel cars, such as were in ordinary use. The point of draft was by the frame of one of the said four-wheel cars.

To the fifth cross-interrogatory, he saith:

*Fifth X.* I am now constructing eight-wheel cars, similar to those in common use. I have no license, but build, by order of railroad companies, such cars as they want.

To the sixth cross-interrogatory, he saith:

*Sixth X.* I have not seen, heard, or had stated to me, the substance of any of the interrogatories, prior to my present examination.

W. E. RUTTER.

CHAS. HEAZLITT, }  
ROBERT P. KANE, } *Comr's.*

## DEPOSITION OF JOHN A. McCLAIN.

NOVEMBER 28, 1853. John A. McClain being duly sworn, on the part of the Respondent, deposeth and saith as follows:

To the first interrogatory, he saith:

*First.* My name is John A. McClain, aged thirty years; residence,

201, Melon street; business or occupation, dispatcher for Reading Railroad Company.

To the second interrogatory, he saith :

*Second.* I am conversant with the principles of construction and operation of the eight-wheel railroad cars in general use in the United States. My opportunities for becoming acquainted with the principles of construction and operation of the cars are founded upon my connection with railroads. I have been conductor upon the Baltimore and Susquehanna Railroad, and upon the Reading Railroad. I was four years connected with the former road, from 1845 to 1849, and on the Reading road I have since been, and am now, summer conductor, and in the winter season, dispatcher. While so engaged I have paid particular attention to the subject inquired of.

To the third interrogatory, he saith :

*Third.* I was born in the city of Baltimore; I resided there until the spring of 1832, when I left Baltimore and went to East Tennessee, and resided there until 1839, in which year I returned to Baltimore. I remained there until 1849, when I removed to the County of Philadelphia, where I have remained ever since.

To the fourth interrogatory, he saith :

*Fourth.* The first eight-wheel cars that I ever saw were on the Baltimore and Ohio Road. At the time I saw them they were employed in bringing in a party of rioters, who had been making a disturbance on that road. That was in the month of June, 1832. I am enabled to fix this date by referring to other circumstances occurring about the same time.

To the fifth interrogatory, he saith :

*Fifth.* The recollection of these cars that I have mentioned is distinct in my mind.

To the sixth interrogatory, he saith :

*Sixth.* The cars which I saw consisted of two four-wheel trucks, with bolster and centre pin. The model marked M, and identified with my signature, is a correct model of said car, so far as regards the running gear attached. They are the same in principle as the eight-wheel cars now in general use.

To the seventh interrogatory, he saith :

*Seventh.* I did not see any other eight-wheel car upon the said road until 1832. It was a passenger car, used for conveying passengers. I rode from Baltimore to Ellicott's Mills in this car in that year. The running gear was constructed as is shown in the model (M.)

To the eighth interrogatory, he saith :

*Eighth.* There is no doubt on my mind as to my first seeing eight-wheel railroad cars used as I have stated.

To the ninth interrogatory, he saith :

*Ninth.* The eight-wheel cars in use on the road in which I am now employed, have two four-wheel trucks, rigid wheel-frame, iron pedestals confining the boxes; a spring between the box and the frame; they have male and female bed plate and centre pin fastened through the car and bed plate into the truck, allowing the truck to conform to the curves of the road. I have never seen any eight-wheel car upon one road having long springs extending from one axle to another, and the ends thereof bolted to the tops of the boxes, and a bolster bolted

across to the middles of the two springs, with another bolster swiveling on it, like a common road waggon.

To the tenth interrogatory, he saith :

*Tenth.* I do not know any other matter or thing of advantage to Respondent in this suit.

To the first cross-interrogatory, he saith :

*First X.* The point of draft of the eight-wheel platform cars mentioned by me, was by the middle of the forward truck.

To the second cross-interrogatory, he saith :

*Second X.* I was clerk in a store between the years 1832 and 1840, in Leesburg, Washington County, East Tennessee.

To the third cross-interrogatory, he saith :

*Third X.* I have not received a scientific education, in mechanics or other science.

To the fourth cross-interrogatory, he saith :

*Fourth X.* What I consider to be [?] principle of the eight-wheel car now in common use, the invention of which is claimed by the Plaintiff, is placing two four-wheel trucks under one body, allowing them to swivel to the curves of the road.

JOHN A. McCLAIN.

CHAS. F. HEAZLITT, }  
ROBERT P. KANE, } *Com'rs.*

#### DEPOSITION OF JOHN A. CURRIE.

NOVEMBER 8, 1853. John A. Currie, being duly sworn on behalf of the Defendants, saith, in answer to interrogatory

*First.* My name is John A. Currie, aged forty-three years last May, and reside in the city of Philadelphia, and have so resided for the last seven years; by occupation an artist and restorer of paintings; I have been thirty-three years in that profession.

In answer to the second interrogatory, he saith :

*Second.* I am acquainted with the modes and processes of restoring old pictures and drawings, and of making new pictures and new drawings to resemble old ones. I have done it a thousand times.

In answer to the third interrogatory, he saith :

*Third.* We have a way of first staining the paper to look old, with tobacco juice. We have another mode of staining the paper, with burnt vegetable matter, such as cabbage leaves, &c. We have another mode of staining the paper to look old, by a solution of bitumen. There are various ways of smoking the paper by the smoke of burnt oil, and the smoke of burnt coal; but the common and most effectual way is from the burning of straw or hay, or something of that kind; and by hanging the painting or paper in the smoke, it gives the appearance of age. This is the mode most frequently resorted to, in the smoking of paper. It causes a nearer resemblance to age than any other practice, and gives the appearance of long use.

In answer to the fourth interrogatory, he saith :

*Fourth.* All the modes which I have described in my answer to

the third interrogatory, are practised; but that in most constant practice is the smoking by straw, or hay, or coal, or by hanging in the chimney.

JOHN A. CURRIE.

CHAS. F. HEAZLITT, }  
ROBERT P. KANE, } *Com's.*

### DEPOSITION OF ASA WHITNEY.

NOVEMBER 29, 1853. Asa Whitney, being duly sworn on the part of the Respondent, deposeth and saith as follows:

To the first interrogatory, he saith:

*First.* My name is Asa Whitney, aged about 62 years; residence in the city of Philadelphia; by business or occupation, machinist and founder.

To the second interrogatory, he saith:

*Second.* It was on the Mohawk and Hudson Railroad, in the winter of 1831 and 1832. I think in the year 1832 I was connected with the application of the four-wheel truck to railroad engines. So far as my knowledge extends, the four-wheel truck that was constructed, was after a design by John B. Jervis, to put under a locomotive engine called the "Experiment," to be used on the Mohawk and Hudson Railroad. It was built at the West Point Foundry Association, N. Y. It was subsequently used upon that road. It was in the winter of 1831 or spring of 1832, that I saw this design by Mr. Jervis.

To the third interrogatory, he saith:

*Third.* The truck-frame was a rigid rectangular structure, under which were two axles and two wheels on each axle; the axles being parallel and about the same distance apart as the width of the track. The superincumbent weight rested upon this truck on side bearings, equidistant from either axle, thus distributing the weight equally on each pair of wheels; the truck being free to move around a centre pin or king-bolt, firmly attached to the fore part of the engine, which it carried. The truck was driven through the medium of this centre pin or king-bolt, and as it moved forward or backward it was free to conform to the curvature or undulations of the road. There were springs over the journals of the axles of the trucks, which were free to move up and down in pedestals, within which they were placed.

So far as the principle of action is concerned, that truck and similar ones have been used ever since, so far as I know. They did not differ, in the principles of their construction and application from the principles of construction and application now in general use.

To the fourth interrogatory, he saith:

*Fourth.* In the engine "Experiment," there was no necessity for any modification or alteration of the steam machinery. In another engine, to which the four-wheel truck was applied, which had been constructed to run on four wheels attached rigidly to the engine frame, an alteration had to be made by taking out one pair of those wheels, and substituting the truck therefor, and removing the other pair farther back of the engine frame. I planned the change in the machinery for this engine.

The object of putting the truck under that engine, was to put the bearing points farther apart, and distribute the weight upon more



wheels. In doing so, we had to change the driving wheels back of the fire box, and communicate the power of the engine to them through the medium of a bell crank. This change was necessary, because the cylinder was located in the machine to communicate their power to the drivers when they were front of the fire-box: when we came to move them back of the fire-box, to communicate the power of the engine to them, it was deemed cheaper to do it through the bell crank, than to move the cylinders to such location as would be necessary to work directly on to the driving wheels. Engines were subsequently made with all their parts adapted to the use of the truck, without their cost being increased thereby over and above that incident to the former mode of structure; that is, without truck.

To the fifth interrogatory, he saith:

*Fifth.* The duplication of such trucks under both ends of a car body, on the same principle, would not involve any invention, because we run those engines over the road one way with a truck forward, having at that time no turn-table at one end of the road; they were run back with the engine in the front, without turning round.

To the sixth interrogatory, he saith:

*Sixth.* The engine, with said truck under the body, drew its train or load by a coupling from the middle of the end of the body or main frame of the engine.

To the first cross-interrogatory, he saith:

*First X.* When a locomotive, as ordinarily constructed, or constructed like that of which I saw the design by Mr. Jervis, moves upon a curve, some of the driving wheels have to *slip upon the rails to permit it to diverge from a straight line*. That requires that a portion of the power of the engine be applied in producing that lateral slip. This is a matter of practical experience.

To the second cross-interrogatory, he saith:

*Second X.* When such a locomotive moves upon a curve, the friction of the flanges of the wheels of the truck against the outer rail is increased beyond what is due to their diagonal position, by the force that is necessary to overcome the adhesion of the driving wheels, and to cause them to slip, so as to diverge from a right line and follow the rails.

To the third cross-interrogatory, he saith:

*Third X.* The rigidity of the axles of the driving wheels increases the friction between the rail and the flanges of the wheels in the truck.

To the fourth cross-interrogatory, he saith:

*Fourth X.* That increased friction of the wheels in the truck would be avoided, if the body of the engine had also a free lateral movement at each extremity, so as to move freely to any position required, by the lateral divergence of the truck from a straight line.

To the fifth cross-interrogatory, he saith:

*Fifth X.* If the truck under a locomotive were placed at twice the distance from the driving wheels of that usually employed, the so placing of the truck might or might not cause the driving wheels, when on a curve, to act more obliquely upon the rails, and so produce greater friction between their surfaces, than it would if the truck were placed nearer to them. It would depend on the radius of the curve. If the

radius was long, it would be an improvement to place the truck farther from the driving wheels ; if short, it should be nearer to them.

To the sixth cross-interrogatory, he saith :

*Sixth X.* Experience has shown, that for high speeds the engines are run steadier and do less injury to the road, when the extreme parts are far apart. I suppose some of the best engines are fifteen to twenty feet from the rear driver to the front truck wheels ; and the tendency has been to increase the length of the engines and bolsters, placing the wheels farther apart, as we have increased our experience with engines. The trucks are placed at the forward end of the machine ; roads of large business and requiring power, get that by lengthening the boiler, which seems to be the limit of the length of the machine ; and the driving wheels are placed far back, near the rear end. The truck axles are usually placed about the same distance apart as the width of the track.

A. WHITNEY.

CHAS. F. HEAZLITT, }  
ROBERT P. KANE, } *Comr's.*

#### DEPOSITION OF DAVID MATTHEW.

DECEMBER 10, 1853. David Matthew, a witness produced, sworn and examined on the part of the Respondents, deposes and says :

To the first interrogatory, he saith :

*First.* My name is David Matthew, aged about forty-one years ; steam-engine builder and engineer, by business or profession ; I reside in the county of Philadelphia.

To the second interrogatory, he saith :

*Second.* I was engaged, in 1830, in constructing the machinery for the Delaware and Hudson Railway, and the Charleston and Augusta Railway, at the West Point establishment.

I was engaged, in 1831, in constructing and putting in operation the motive power on the Hudson and Mohawk Railroad. I was engaged from June, 1831, to 1 December, 1831, as engineer on the Mohawk and Hudson Railroad. From December, 1831, till August, 1832, at the West Point establishment. From August, 1832, till 1 July, 1836, as engineer, and in charge of motive power on the Hudson and Mohawk Railroad. In September, 1835, I was appointed Chief Engineer and Machinist of the Utica and Schenectady Railroad, and so continued till August, 1842. Since that time, with the exception of two years, I have been engaged in superintending the construction and arrangement of machinery in general, such as engines and machinery for government steamers and merchant steamers, steam engines, and other machinery.

To the third interrogatory, he saith :

*Third.* The design of a locomotive, having a four-wheel truck under the first end, was got up in the office of John B. Jervis, chief engineer of the Mohawk and Hudson Railroad, in 1831. I can't say who designed it. It was drawn in Mr. Jervis's office, and I saw the drawing there. I was there frequently, and saw the drawing. Mr. Jervis gave an order for the construction of an engine after the design, and it was built accordingly. I left New York in August, 1832, to put that engine in operation, and she was put in operation on said road, either the

latter part of August or beginning of September, 1832. That was the first and only one in existence at that time, on that plan, to our knowledge. This engine was called the "Experiment." A similar engine was subsequently ordered in England, and being built, was put on the Schenectady and Saratoga Railway. I think it was put on the railroad in 1832. She was called the "Davy Crockett." I am not sure that the year 1832 is correct, but the "Davy Crockett" was the first engine that ran on the Schenectady and Saratoga Railroad. In the fall of 1832, the English engine "Robert Fulton," which was a four-wheel driver, was changed into a two-wheel driver, and a truck placed under her forward end. The work was superintended by me. Mr. Whitney was superintendent of the road.

Other locomotives were built upon the same plan,—two were imported from England upon the same plan. One was called the "Mohawk," and the other was called the "Hudson," and were used on the Hudson and Mohawk Railroad.

To the fourth interrogatory, he saith :

*Fourth.* I can't say who was the inventor of the said locomotives. It was got up amongst us in the office of Mr. Jervis. We never thought enough of it to make a separate claim for the merit of the invention. Mr. Jervis, Mr. Whitney and myself were all concerned in making improvements, such as we thought would be most beneficial to the railroad. I can't say who the draughtsman in the office was. I have a copy of the drawings from which the engine "Experiment" was built, and hereunto annex a true copy thereof, marked A 2 and A 3. The drawing was made at the West Point Foundry, where the engine was built.

I have stated all I know in relation to the invention of this engine.

To the fifth interrogatory, he saith :

*Fifth.* The construction and application of the truck in its position relatively to the end of the body of the engine, and in its action upon the road and on the body of the engine, does develop the same physical principles as the present mode of applying the four-wheel truck, under or near the end of the body of a railroad car. Whether or not a duplication of said trucks upon the other end of the body or engine would require invention, I am not prepared to say. It is a new combination, and as such is entitled to consideration.

To the sixth interrogatory, he saith :

*Sixth.* The said locomotive embodied the principles of eight-wheel double-truck railroad cars in this : the trucks were the same—combined the same properties to enable them to swivel to the curves and irregularities of the road. The arrangement of the wheels as to distance were similar, and combined the same principles. The arrangement of the running gear in general, was similar to the eight-wheel cars now in use.

To the first cross-interrogatory, he saith :

*First X.* The principle of the eight-wheel double-truck car is to accommodate itself to the curves and irregularities of the road, either vertically or horizontally.

To the second cross-interrogatory, he saith :

*Second X.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, or any of them, except through the Commissioner.

DAVID MATTHEW.

CHAS. F. HEAZLITT, }  
ROBERT P. KANE, } *Com'rs.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

To the Honorable the Judges of the Circuit Court of the United States in and for the Massachusetts District.

We, Charles F. Heazlitt and Robert P. Kane, Commissioners named in the annexed commission, hereby certify, that we were attended by the witnesses whose names are set to the annexed written depositions, upon the several days between the first day of November, A. D. 1853, and the nineteenth day of December, A. D. 1853; that the said witnesses were of lawful age, and having been by us severally and carefully examined and cautioned, and sworn or affirmed in the aforesaid cause, to make true answers to the interrogatories and cross-interrogatories in the annexed commission propounded, the same were then and there by us propounded to them, and the answers of the said witnesses to the said interrogatories and cross-interrogatories, then and there, were reduced to writing in our presence and in the presence of the witnesses, who subscribed each page of such answers in our presence. And we having retained the said depositions in our presence until now, do herewith transmit the same by mail, to the Honorable Court aforesaid.

Dated this twenty-ninth day of December, 1853.

CHAS. F. HEAZLITT, }  
ROBERT P. KANE, } *Com'rs.*

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## UNITED STATES OF AMERICA.

THE CIRCUIT COURT OF THE UNITED STATES WITHIN AND FOR THE MASSACHUSETTS DISTRICT.

MASSACHUSETTS DISTRICT, ss.

To Joseph Bridgham, of New York, in the S. District of New York, Esquire, U. S. Commissioner.

Know ye, that reposing confidence in your wisdom, prudence, and fidelity, we have appointed, and by these presents do authorise and empower you to take the answers to the interrogatories hereunto annexed, of Albert Bridges, Jeremiah Van Rensselaer, Charles B. Stuart, Wm. J. McAlpine, Henry Waterman, William T. Ragland, E. French, William C. Young, Charles Minot, Christian E. Detmold, John B. Jervis, Robert Higham; James W. Brooks, Detroit; Charles Slaughter, Ogdensburg; — Johnson, Troy; Stephen W. Worden, Troy; David Beggs, Syracuse; Walter McQueen, Schenectady; George Beach, Troy; Leonard R. Sargent, Troy; George Law, N. Y.; and John Wilkinson, of Syracuse: witnesses to be examined on behalf of the Complainants, and to be used in a certain cause now pending in



said Court, wherein Ross Winans is Plaintiff, *vs.* The Eastern Railroad Company, Defendant.

And to this end, at certain days to be by you appointed for that purpose, to cause said witnesses, as aforesaid, to be brought before you, and each witness, while present before you, to examine carefully on oath, touching the premises. And when you shall have taken the examination as aforesaid, to reduce or cause the same to be reduced to writing, and to be subscribed by each of said witnesses in your presence. And the same, so taken and subscribed, to return, together with this commission and your doings herein enclosed, sealed and directed to the Circuit Court aforesaid, to be holden at Boston, on the 15th inst., as soon as the same may be executed.

In testimony whereof, we have caused the seal of the said Circuit Court to be hereunto affixed.

Witness, the Honorable Roger B. Taney, at Boston, this tenth day of October, in the year of our Lord one thousand eight hundred and fifty-three.  
H. W. FULLER, *Clerk.*

N. B.—You shall not, except by consent of the parties in writing, permit either party to attend at the taking of the deposition, either himself, or by any attorney or agent, nor to communicate by interrogatories or suggestions with the deponent whilst giving [?] deposition in answer to the interrogatories annexed to this commission. And you shall take such deposition in a place separate and apart from all other persons, and permit no person to be present during such examination, except the deponent and yourself, and such disinterested person (if any) as you may think fit to appoint as a clerk, to assist you in reducing the deposition to writing. And you shall put the several interrogatories and cross-interrogatories to the deponent in their order, and take the answer of the deponent to each, fully and clearly.

## UNITED STATES OF AMERICA.

THE CIRCUIT COURT OF THE UNITED STATES WITHIN AND FOR THE MASSACHUSETTS DISTRICT.

MASSACHUSETTS DISTRICT, ss.

To Joseph F. Sabine, of the Northern District of New York, Esq., U. S. Commissioner :

Know ye, that reposing confidence in your wisdom, prudence, and fidelity, we have appointed, and by these presents do authorize and empower you, to take the answers to the interrogatories hereunto annexed, of witnesses to be examined on behalf of the Respondent, and to be used in a certain cause now pending in said Court, wherein Ross Winans is Plaintiff, *versus* the Eastern Railroad Company, Defendant.

And to this end, at certain days to be by you appointed for that purpose, to cause said witnesses, as aforesaid, to be brought before you, and each witness, while present before you, to examine carefully on oath touching the premises. And when you shall have taken the examination as aforesaid, to reduce or cause the same to be reduced to writing, and to be subscribed by each of said witnesses in your presence. And

the same, so taken and subscribed, to return, together with this Commission, and your doings herein inclosed, sealed and directed to the Court aforesaid, now holden at Boston, as soon as the same may be executed.

In testimony whereof, we have caused the seal of the said Circuit Court to be hereunto affixed.

Witness the Honorable Roger B. Taney, at Boston, this twenty-fifth day of October, in the year of our Lord one thousand eight hundred and fifty-three.

H. W. FULLER, *Clerk.*

N. B. You shall not, except by consent of the parties, in writing, permit either party to attend at the taking of the depositions, either himself, or by any attorney or agent, nor to communicate, by interrogatories or suggestions with the deponents whilst giving their depositions in answer to the interrogatories annexed to this commission. And you shall take such depositions in a place separate and apart from all other persons, and permit no person to be present during such examination, except the deponents and yourself, and such disinterested person (if any) as you may think fit to appoint as a clerk, to assist you in reducing the depositions to writing. And you shall put the several interrogatories and cross-interrogatories to the deponents in their order, and take the answer of the deponents to each fully and clearly.

## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

*Interrogatories proposed to Charles Minot, of New York.*

1. State your name, age, residence, and business or occupation, and how you have been engaged for about nine years previous to your present position.

2. Have you examined the eight-wheel cars in general use on railroads? and whether or not your business required you to possess a knowledge of the same?

3. Are you acquainted with Ross Winans, the Plaintiff? how long have you been acquainted with him?

4. Was Ross Winans at the Boston and Maine Railroad Depot at any time while you had charge there? if so, state what he was doing there where the eight-wheel passenger cars were kept; what opportunities he had of seeing the same; whether you conversed with him there; and whether or not he claimed the said eight-wheel cars as his invention, or made any claim on the company for the use of the same.

5. Whether or not Ross Winans rode on such eight-wheel cars, in trying his experiments with a locomotive engine.

6. Whether the said eight-wheel cars were the same in principle of construction and operation as those of the Eastern Railroad, and in general use in the United States.

7. Have you examined the specification of Ross Winans's patent, of October 1st, 1834? and have you or not, of late years, conversed with Ross Winans? and did he not make any statements about the course he had adopted in reference to litigating his patents? if so, state what he said.

8. Have you or not conversed with said Ross Winans about his eight-wheel car patent, and did he or not communicate to you, that he had agreed with parties at Albany to prosecute it? if so, state what he said.

Objected to as irrelevant and incompetent; the records of the Patent Office being the only evidence admissible.

9. Whether or not after this you received a circular from Charles D. Gould of Albany, and J. A. Spencer of Utica, addressed to you? if so, annex the same or a true copy thereof to your answer.

10. Whether or not after receiving said circular, did you have any further conversation with the said Winans, on the subject of the said eight-wheel car, or his interest or want of interest in the matter? please state what was said.

WILLIAM WHITING, *Defendant's Solicitor.*

[Objected to as above.]

The Complainant objecting as above, declines to cross-examine this witness.

C. P. CURTIS, JR., *Complainant's Solicitor.*

## CIRCUIT COURT OF THE UNITED STATES.

### DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

*Interrogatories proposed to Leonard R. Sargent, of Troy, on behalf of the Respondent.*

1. State your name, age, residence, and occupation or business.

2. Whether or not you are acquainted with the eight-wheel cars in general use on railroads?

3. Whether or not have you examined the treatise of Tredgold on Railroads and Carriages, published in London, in 1825, more particularly pages 94 and 179, and the drawing shown on plate iv, figure 26? And have you measured the proportions which different parts of the said drawing bear to each other? If so, will you state in equal parts, the following admeasurements, viz:

1. The diameter of the wheels.

2. The distance of the wheels apart.

3. The distance from the centre of the truck to the end of the car.

4. Distance from centre to centre of axles.

Will you state the answers to the same questions as to any car upon the Rochester and Syracuse Railroad?

[Objected to as irrelevant.]

Also will you answer to the same questions in regard to any car upon the Hudson River Railroad?

[Objected to as irrelevant.]

*4th Question.* What are the distances of the wheels apart of the eight-wheel cars generally in use in each truck on these railroads, and how does that distance compare with the distance between the bearing points of the wheels in each truck in the Tredgold drawing?

WILLIAM WHITING, *Defts. Sol'r.*

[Objected to as irrelevant.]

The Complainant, objecting to the third and fourth interrogatories, as irrelevant to the issue between him and the Eastern Railroad Company, declines cross-examining this witness.

C. P. CURTIS, JR., *Compt's Solicitor.*

## CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

*Interrogatories to John B. Jervis, of New York, on the part of the Respondents.*

1. What is your name, age, place of residence, and business, or profession?

2. On what public works, and at what times have you been engaged, including railroads?

3. What experience and attention have you given to the arrangement of the wheels of locomotives?

4. If at any time you invented a locomotive engine with bearing carriage, will you please to say when you invented it; and if it was put in operation, when it was so put in operation; and will you describe it so far as relates to the running part, and its connection with the body or frame-work?

5. If at any time you wrote and published or saw published, any statement in respect to the running gear or swivel trucks or to said engines, will you state when you wrote it, when and where it was published, and in what periodical, and annex the original or a true copy thereof to your answer?

6. Will you state what applications were made, if any, of the principles stated by you, to any engines or locomotives? And give a full account of the same, their construction, and names, and mode of operation.

7. Will you annex to your answer any original drawing of either of said engines, or of the bearing carriage thereof, or a true copy thereof?

8. Whether or not did the construction and application of the truck, in its position relatively to the end of the body of the engine, and in its action upon the road and on the body of the engine, develop the same physical principles as the present mode of applying the four-wheel truck, under or near the end of the body of a railroad car? And whether or not, a duplication of the said trucks upon the other end of the body or engine would require invention?

WILLIAM WHITING, *Solicitor of Defendant.*

## UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS IN EQUITY vs. THE EASTERN RAILROAD COMPANY.

*Cross-Interrogatories to John B. Jervis and Asa Whitney.*

1. When a locomotive, as ordinarily constructed, or constructed like that invented by you, moves upon a curve, do not some of the driving



wheels have to slip upon the rails, to permit it to diverge from a straight line; and does not that require that a lateral force shall be applied to the forward end of the engine, sufficient to overcome the adhesion of the wheels, and produce that divergence? Is not this a matter of practical experience?

2. When such a locomotive moves upon a curve is not the friction of the flanges of the wheels of the truck against the outer rail increased beyond what is due to their diagonal position, by the force that is necessary to overcome the adhesion of the driving wheels, and to cause them to slip, so as to diverge from a right line and follow the rails?

3. Does not the rigidity of the axles of the driving wheels increase the friction between the rail and the flanges of the wheels in the truck?

4. Would not that increased friction of the wheels in the truck be avoided if the body of the engine had also a free lateral movement at each extremity, so as to move freely to any position required by the lateral divergence of the truck from a straight line?

5. If the truck under a locomotive were placed at twice the distance from the driving wheels of that usually employed, would not the so placing the truck cause the driving wheels, when on a curve, to act more obliquely upon the rails, and so produce greater friction between their surfaces than it would if the truck were placed nearer to them—other things equal?

6. Please state the best practical relative position of the truck and driving wheels of a locomotive, and the reasons and causes governing the same?

C. P. CURTIS, JR., *Complainant's Solicitor*.

## CIRCUIT COURT OF THE UNITED STATES.

### DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. EASTERN RAILROAD COMPANY.

*Interrogatories to be proposed on the part of the Respondent, to Christian E. Detmold, of New York City.*

1. What is your name, age, place of residence, and business or profession?

2. What connection have you with the Chrystal Palace at New York?

3. What was your profession, and where were you engaged in the summer of 1828?

4. What was your relation or connexion in business with Mr. Horatio Allen, now of New York?

5. Whether or not did you, at any time, and if so, when, make any drawings of any eight-wheeled double-truck steam carriage? If yea, will you annex the same to your answer, or a true copy or duplicate thereof?

6. Whether or not are you positive as to the date at which said drawings were so made?

7. Were said drawings made under the direction of any person, and if so, whose?

8. Who, so far as you know, was the inventor of said steam carriage?

9. If the whole principle of these eight-wheel double-truck steam carriages was known and invented at any time previous to the making of said drawings, when and how long before that event was said

principle known and invented? and how do you know the fact stated by you?

10. What steam carriage, if any, was built upon the plan of said drawings; and what was she called? When and where was she built? When and where put to use; and how did she answer the purpose; and what advantages had she, if any, over other steam carriages, so far as regards the arrangement of the wheels in each truck, and the connection of the trucks with the body?

11. Will you explain the parts and the principles of operation of said steam carriage?

12. Whether or not do you know as to Mr. Horatio Allen having sent on to the President and Directors of the South Carolina Railroad Company any report on the subject of the eight-wheel railroad steam carriage? If so, when was it made and sent in; and have you seen the same in print? If yea, when was it printed and published?

13. Will you state what was done by Mr. Allen on the subject of getting said steam carriages built; and state the dates? How many of said steam carriages were built? When and where were they built? When and where were they put in operation? and how did they work?

14. Whether or not was it necessary, in order to convert said eight-wheel double-truck steam carriages into passenger cars, to make any changes in the arrangement of the wheels, or the connection of the trucks with the body or frame of the body?

15. Whether or not were the mechanical principles of the running part of the said steam carriages the same or different from the principles of the ordinary eight-wheel passenger cars now in common use in the United States; and whether or not, having said knowledge of steam carriage, did it require invention to construct the eight-wheel cars now in common use.

WILLIAM WHITING, *Solicitor of Defendants.*

## UNITED STATES CIRCUIT COURT.

MASSACHUSETTS DISTRICT.

ROSS WINANS, IN EQUITY, *vs.* THE EASTERN RAILROAD COMPANY.

*Cross-Interrogatories to C. E. Detmold.*

1 X. Please to state fully and distinctly what you understand to be the principle of the eight-wheel passenger car claimed by the Complainant?

2 X. Please to state what you consider to be the principle of the "double-truck steam carriage," and what do you understand by the term "principle of operation," as used in the 8th, 11th, and 15th direct interrogatories?

3 X. Have you seen, heard, or had stated to you, the substance of any of the foregoing interrogatories, prior to your present examination? If yea, by whom?

C. P. CURTIS, JR., *Complainant's Solicitor.*

## UNITED STATES CIRCUIT COURT.

DISTRICT OF MASSACHUSETTS.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

## THE DEPOSITIONS

*Of Christian E. Detmold, William C. Young, Edmund French, Charles Minot, Charles B. Stuart, Walter McQueen, John Wilkin-son, Jeremiah Van Rensselaer, Albert Bridges, William J. McAl-pine, Henry Waterman, John B. Jervis, George Beach, and Stephen M. Worden, witnesses named in the commission hereto annexed; taken in the above named cause, by and before Joseph F. Sabine, United States Commissioner in and for the Northern District of New York, appointed a Commissioner to take answers to the interroga-tories and cross-interrogatories hereto annexed, and herewith returned by the Circuit Court of the United States for the District of Massa-chusetts, and by virtue of the commission issuing out of and under the seal of the aforesaid Court, hereto annexed, and herewith return-ed, viz :*

## DEPOSITION OF WILLIAM C. YOUNG.

William C. Young, a witness on the part of the Respondents, being duly sworn, saith :

In answer to the first interrogatory, he saith :

1. My name is William C. Young; age, 53 years; place of busi-ness and residence, New York. I am a civil engineer; my more im-mEDIATE business being the superintendence of the construction and operation of railroads, and the superintending of the planning of railroad machinery, including cars, &c.

To the second interrogatory, the witness saith :

2. I studied the principles of mechanical philosophy at West Point, from which I was graduated in 1822. As resident engineer, I located and superintended the building of the Saratoga and Schenectady Rail-road, and organized its running operations, in the years 1831, 1832 and 1833. I was chief engineer of the Utica and Schenectady Railroad, from 1833 to 1849, and superintended the location and construction and opera-tion of running. I had entire oversight of all the cars and engines—both the construction and repairs, improvements and alterations thereof; the work being done by persons under my direction. From 1849 to 1852, I was chief engineer of the Hudson River Railroad. I superin-tended the location and construction of the Northern division of that road. The Southern division of the road was nearly finished at the time I entered the service of the company. From 1849 to fall of 1851, the time of the completion, I continued as engineer, as stated; when, upon the completion of the road I left their service. For the past year I have been President of the Panama Railroad Company, of which I had the executive duties to perform. During all this time, from 1831 to the present, my professional occupations have rendered me familiar with the organization and operation of the common running

gear of four and eight-wheel cars, and locomotives, both theoretically and practically. A considerable number of engineers, who have now become prominent in their profession, have studied and practised under my direction; and my profession has required me to examine and study improvements that have, from time to time, grown up in the progress of railroad engineering.

To the third interrogatory, the witness saith :

3. I am.

To the fourth interrogatory, the witness saith :

4. I have examined it.

To the fifth interrogatory, the witness saith :

5. I have examined the model, and carefully compared the different parts of it with the description contained in the specification, and I find it in every particular to be a correct representation of what is therein described and recommended. It represents one of the positions of the truck, viz. "with the bolster so far within the ends of the body of the car as to bring all the wheels under it." The bearings of the springs upon the boxes are properly represented in the model as inside of the wheels; the specification giving no direction to the contrary; and the bearing of the weight of the body is on the centre of the bolster, and is truly represented in the model, as it is required to be by the specifications; but, in the drawing annexed to the patent, the side bearings are extended beyond what the specification requires; that is, beyond the centre of the bolster. The object of the patentee seems to be the avoidance of shocks and concussions by having the weight of the body borne upon the centre of the bolster, so as to admit of a vertical motion of the trucks on each side of the track, without that motion being communicated to the body of the car. To effect this, the bearing is necessarily to be made small, and to be placed at the centre of the trucks, as well as the centre of the bolster.

To the sixth interrogatory, the witness saith :

6. As to the parts which are essential, they are the two trucks, and a body or frame. The organization or arrangement is simply this : the two trucks must be connected to the frame or body, by a king-bolt or its equivalent, in order to allow the trucks to swivel under the frame, and to conform to the curvatures and irregularities of the road; and to produce steadiness of the body, there must be suitable side bearings. The trucks must be placed so far apart as not to interfere with each other; and the wheels in each truck must be placed in such a frame as will keep them square on the track, and near enough together to enable them to pass the curves of the road without cramping, and far enough apart to keep them steady on the track.

To the seventh interrogatory, the witness saith :

7. There are various improvements now in common use in the eight-wheel cars in this country, not suggested in the remotest manner in the patent, and upon which much of the comfort and safety of the railroad travelling depends. Some of them are indispensable to the success of railroad conveyance, at the rapid rates which are now common. Among these, I may mention *side bearings*, without which express trains could not be run; also rigid truck frames and spring pedestals. There are a variety of other essential improvements.

To the eighth interrogatory, the witness saith :



8. The trucks and body are separated by removing the king-bolt, or its equivalent. The bolsters are usually placed about five to seven feet from the end of the body in this part of the country.

To the ninth interrogatory, the witness saith :

9. The cars have side-bearings, because they have been found, by universal experience, to be essential to safety, and necessary in order to keep the body from being turned or lopped over, by its centrifugal force, on turning curves at high velocities, and also to preserve them in their upright position at all times, when loaded unequally on the two sides. Side bearings are also of importance to give steadiness to the trucks themselves.

To the tenth interrogatory, the witness saith :

10. They are used for the purpose of keeping the trucks nearl ine their ordinary position, in case of going off the track, and to pre en- them from swivelling round too far, and to hold up a corner of the truck in case of breaking a wheel or axle.

To the eleventh interrogatory, the witness saith :

11. Lengthening the body of the car does not introduce into the car any new principle of organization, construction, or operation. Such change requires no exercise of invention. It is a change obvious to any car builder.

To the twelfth interrogatory, the witness saith :

12. I do not think that connecting the axles by springs, or any elastic substance, is a proper way of constructing a truck. It is necessary that the connexion should be a rigid one, which will not allow the wheels to approach or recede from each other, and to preserve the parallelism of the axles, and to keep the trucks square at all times. I should consider trucks constructed according to Winans's specification as unsafe, and unfit for prudent use : 1st. Because the truck cannot be kept square on the track, from the elasticity of the springs as well as from the twisting of the leaves. 2d. The axles cannot be kept parallel when running, and the liability of the springs to break will endanger the car, as the consequence of breaking will be to overthrow the car. 3d. The safe application of brakes to these trucks would be impossible, without introducing various alterations, to apply them to the truck as described in the specification, and be likely soon to break off the spring at the point where they are united to the boxes.

To the twelfth interrogatory, the witness saith :

12. As the truck is particularly described in the specification, it would not be possible to put a brake upon it without endangering the truck, as explained in my last answer. The drawing therein differs from the specification. Also this drawing represents a freight car, and not a passenger car, which is the only one described in Mr. Winans's specification. The drawing represents a rigid rectangular wheel-frame for the trucks. In the specification, instead of a rigid wheel-frame, the axles of the wheels were connected only by a steel spring, bolted to the boxes of the axles, with a bolster bolted across to the tops of the springs. The drawing represents two springs on each side of the truck frame, the action and re-action of which may not tend to throw the axes of the wheels out of parallelism. The specification particularly recommends one spring only on each side of the truck, to connect the axes of the wheels, but admits the ordinary truck ; and the action of that spring

would necessarily throw the axes out of parallelism. The drawing represents the springs with the shorter leaves downwards. The specification directs exactly the reverse. In the drawing, the bolsters on which the body rests are placed between five and six feet from the ends of the platform of the car; whereas the specification requires the same to be placed at, or near, or beyond the ends of the body, and in any event, no further under the body than that the wheels shall come just within the ends; and the trucks are to be coupled as remotely from each other as can conveniently be done for the support of one body. In the drawing, the wheels are placed sufficiently far apart to put a brake between them; while in the specification the wheels are directed to be as close as possible without the flanges touching, to have them act, as near as may be, like a single wheel. The drawings represent a conical pivot, marked X, with sockets and side bearings, forming a solid bolster in one solid piece, with a lower bolster and pocket, Y, to correspond; while the specification describes a plain bolster of wood or iron, reaching across from spring to spring, united to an upper bolster by a king bolt, swivelling in the manner of the front bolster of a common road wagon. The drawing shows a mode of coupling or drawing the cars by two pieces bolted across the bottom framing, and a coupling bolt, with a ring to it, to drop through the coupling, to draw the car from the middle of the end of the body; the specification neither describes nor intimates any mode whatever by which the cars are to be drawn. The drawing shows cast-iron pockets for the ends of the springs to work in; the specification prescribes a different mode of fastening the ends of the springs, viz., bolting the ends of them on to the axles. The drawing shows an arrangement of brakes suited to the swiveling trucks of the eight-wheel car; the specification does not describe nor mention any mode of arranging or using brakes.

To the fourteenth interrogatory, the witness saith:

14. I have.

To the fifteenth interrogatory, the witness saith:

15. The drawing and specification in Chapman's patent, clearly show and describe a six-wheel car having one truck swiveling under the forward part of the body. The specification mentions the use of two such swiveling trucks under one body of considerable length, for the purpose of conforming to the curvatures of the roads. The model correctly represents the eight-wheel car thus described. The drawing of the plate V, figure 1, shows a means of locomotion attached to the body of a four-wheel car or locomotive. But I consider that it is immaterial to the construction, organization and arrangement of the running gear, whether the car is drawn by the body, or in the manner shown in the drawings of No. 1. The model truly represents the eight-wheel car described in the specification.

To the sixteenth interrogatory, the witness saith:

16. From the description and drawing in the Chapman patent, a car builder of ordinary skill, in 1814, would have been able to build such eight-wheel cars as are now in common use, in all that is essential and elemental. Such car, built according to said patent, would embrace the two trucks swiveling under the body, with a king-bolt connection and side bearings, and rigid solid square wheel-frames, with axles so

far apart as the gauge of the track, and the trucks placed at a proper distance from the end of the body.

To the seventeenth interrogatory, the witness saith :

17. Yes, sir.

To the eighteenth interrogatory, the witness saith :

18. I have measured the same on the drawing, and find the distance of the bearing points of the wheels something less than the width of the track.

To the nineteenth interrogatory, the witness saith :

19. It may.

To the twentieth interrogatory, the witness saith :

20. I have examined the original work here inquired about, and I do there find a drawing and specification of an eight-wheel railroad car.

To the twenty-first interrogatory, the witness saith :

21. The component parts of the car shown in said treatise and drawing, consist of a car body double the usual length of the four-wheel cars, two four-wheel trucks, each truck having four wheels, united by a rigid rectangular wheel-frame, and the middle or centre of said truck being united to the body by means of a swiveling bearing, which will allow the truck freely to swivel, and easily to pass all the curves and inequalities of a railroad ; the points at which said swiveling bearings support the body, are so far distant from each other as to allow the trucks not to interfere with each other, while they are at the same time protected from collision in trains by the ends of the body projecting beyond them. The distance of the bearing points of the wheels from each other will be a few inches wider than the gauge or width of the track they are intended to run upon, assuming the track to be of the ordinary width, and the wheels to be of the ordinary diameter. The drawings and description plainly show that the truck is to swivel horizontally. Cars thus constructed are calculated to adapt themselves to all the curves, straight track and inequalities of railroads, and to pursue a steady and safe course on the track, far superior to the ordinary four-wheel car, if provided with proper side bearings.

To the twenty-second interrogatory, the witness saith :

22. I have examined model A, and consider it a correct representation of the car described and shown in Tredgold's work. The mode of draft on the model is not shown on the drawing of the eight-wheel car, but is represented in different parts of the work, and indeed is the only mode of draft there shown. I have examined model C, and it is not a correct representation of any eight-wheel car described and shown in the work of Mr. Tredgold ; because the body is not connected to the wheel-frame by an axis on which the frames turn so as to accommodate themselves to the curvatures of the road. This could not be done by a car constructed like model C. To conform to the requirements of Tredgold's book, the trucks must be able to swivel, both vertically and horizontally.

To the twenty-third interrogatory, the witness saith :

23. I have examined and compared them. I consider them substantially identical, except in the use of side bearings.

To the twenty-fourth interrogatory, the witness saith :

24. The Tredgold car, as described in the book, is expressly adapted to conform to all the curvatures and irregularities of railroads, and to ac-



comply with the objects designed to be attained by Mr. Winans; but both inventions are defective in side bearings.

To the twenty-fifth interrogatory, the witness saith:

25. I have examined a copy of the patent of Fairlamb. I find in one of the drawings an eight-wheel car with two swiveling trucks, one near each end, containing some of the peculiarities of said Winans's; such as the very close proximity of the wheels in each truck; but the axles are not united by springs. The body is borne upon a large centre plate, or transom plate. It contains a supposed improvement in the apparatus for allowing the axles to vary in distance from each other. The drawing shows all the important or substantial features of the car described in Winans's claim, except the elastic truck and the centre bearing upon the bolster.

To the twenty-sixth interrogatory, the witness saith:

26. To the first branch of the question I answer in the affirmative. By leaving out Fairlamb's supposed improvement of the vibrating axles, and placing the wheels of each truck further apart, the car thus constituted would embody all that is essential in the eight-wheel car now in common use.

To the twenty-seventh interrogatory, the witness saith:

27. I have examined the model. The mechanical principles of its construction and arrangement, are precisely the same as those of the eight-wheel car in common use, and is calculated to answer the same purposes. It embodies in one form, the arrangement of the wheels and the connection thereof, with the body described in the patent, so far as relates to the general mechanical principles; but it has not the elastic spring, and it has side bearings.

To the twenty-eighth interrogatory, the witness saith:

28. I have examined the model of the car marked G. Bryant, now shown me. It is constructed with two trucks swiveling under the ends of one platform, and operates precisely upon the same principles as the ordinary eight-wheel car, and is so constructed as to answer the same purposes.

To the twenty-ninth interrogatory, the witness saith:

29. The said car contains all that is essential that is contained in the car described by the patent. The only difference that is *essential* between them is, that Winans's car bears all its weight upon the centre of the bolster, and has a truck made with springs, and without side bearings; while the Bryant car has side bearings and a rigid wheel-frame. There is no other essential difference in their construction or mode of operation. The peculiar construction of the side bearings embody the advantages claimed by Winans, as arising from the use of his peculiar mode of connecting the body and trucks, as the side bearings on the model do not touch each other so long as the trucks are perfectly horizontal and the load balanced. This was the mode frequently adopted in the earlier periods of my experience.

To the thirtieth interrogatory, the witness saith:

30. Undoubtedly he would.

To the thirty-first interrogatory, the witness saith:

31. I have seen and examined these works. From these books and other means of knowledge, I answer that the mode of drawing by the middle of the ends of the body, were well known before 1830.

To the thirty-second interrogatory, the witness saith:



32. I have examined them as above stated. I find that the distance of the bearing points of the wheels, on the track, is less than the width of the track. The distance is about the same, but rather nearer than the best constructed trucks in the United States.

To the thirty-third interrogatory, the witness saith :

33. I find spring pedestals shown in the London edition of Wood, published in 1831 ; but I have not seen the American edition of Wood, in 1832. The spring pedestals are shown in Allen's model.

To the thirty-fourth interrogatory, the witness saith :

34. The two modes were well known equivalents and were shown in public works prior to that date.

To the thirty-fifth interrogatory, the witness saith :

35. The changes would introduce no new or different principles of construction or operation, into the Quincy or Bryant car ; nor would they require invention to produce them.

To the thirty-sixth interrogatory, the witness saith :

36. The distance between the flanges is not material. The distance between the bearing points is. The former may be changed, by increasing or diminishing the size of the wheels, while the latter will be unchanged.

To the thirty-seventh interrogatory, the witness saith :

37. As I have above said, it is. The reason is, because all the action of the truck upon the rails, and the reaction of the rails upon the truck, is through the bearing points of the wheels ; and the distance of these points is of the utmost importance to the proper and successful use of the swiveling trucks.

To the thirty-eighth interrogatory, the witness saith :

38. Certainly it is necessary that the axles should be kept rigid and parallel to each other. An elastic or spring truck, such as described in Winans's patent, is highly objectionable. So would any truck be dangerous which did not keep the wheels square on the track as well as at an uniform distance.

To the thirty-ninth interrogatory, the witness saith :

39. I do not, at this moment, recall anything in particular.

To the fortieth interrogatory, the witness saith :

40. The theory of Winans, as set forth in his patent, is in my judgment, unsound and erroneous. The theory that bringing the wheels very close together in each truck will cause the truck to avoid unnecessary friction of the flanges upon the rails, is erroneous in actual practice, because unnecessary friction is most avoided by placing the wheels so far apart as to run steadily upon the rails, and the least distance of the bearing points that will answer that purpose on roads of this country, is about the same as the width of the track. The theory of Winans, that the load should be borne upon the centre of the bolster without side bearings, is also erroneous when applied to practice.

The theory of a spring connection of the axles is also erroneous, as applied to practice.

To the cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

To the first cross-interrogatory, the witness saith :

1 X. I have already stated, in answer to the first and second direct interrogatories.

To the second cross-interrogatory, the witness saith :

2 X. This question I have already answered.

To the third cross-interrogatory, the witness saith :

3 X. I am not an expert by profession. I have given opinions, as witness, in one case only.

To the fourth cross-interrogatory, the witness saith :

4 X. I have been so accustomed ; and I refer to my answers to direct questions for answer to this.

To the fifth cross-interrogatory, the witness saith :

5 X. I have stated that in my previous answers.

To the sixth cross-interrogatory, the witness saith :

6 X. I am theoretically and practically acquainted with railroad engineering, and do understand the subjects inquired of.

To the seventh cross-interrogatory, the witness saith :

7 X. It is important that all cars should have as little friction on curves, and on all other parts of the road, as is consistent with obtaining that construction of the car which is essential to utility and safety. But it will not do to sacrifice every other quality of an eight-wheel car for the purpose of avoiding friction. Thus, for instance, if a truck could be so constructed that it would have very little friction in passing curves, and yet be unsteady or unsafe on the straight track, such a truck would not answer. A truck must be constructed with reference to all the qualities which are essential to its safety and usefulness, and not so as to avoid one evil by encountering many others.

To the eighth cross-interrogatory, the witness saith :

8 X. As an abstract proposition the friction between the flanges and rail will be in proportion to the force with which the flanges press upon the rail.

To the ninth cross-interrogatory, the witness saith :

9 X. The wheels of a four-wheel car, or of a truck of an eight-wheel car, will not, in practice, run upon a curve with less friction between the flanges and rails, the nearer the axles of the wheels are to each other. On the contrary, if the wheels are too near to each other the truck will have a zigzag motion, owing to the irregularities of the rails, and will twist round so much as to render the friction far greater than if the wheels were farther apart, because the flanges are brought against the rails in a direction more perpendicular to them than these could happen if the bearing points were more distant. There is a reason in all things, and the proper distance to avoid friction is a just medium between the two extremes.

To the tenth cross-interrogatory, the witness saith :

10 X. According to my judgment and experience the wheels of the trucks of an eight-wheel car will not run upon the curve and over the irregularities of the road, and yield to the guidance of the rails with the least friction, when the trucks have the greatest freedom of motion. The nearer the trucks approach to the action of a single pair of wheels swiveling like the forward wheels of a waggon, the greater the freedom of motion, provided the bearing of the load is on the centre of the bolster. Side bearings impede this freedom of motion ; and yet such an axle, as well as ordinary trucks, run with much less friction with side bearings than without them, because they are kept much steadier in their motion. The friction is most avoided when the forward course

of the truck is most even and steady ; and not when the truck is most easily twisted about so as to be continually running against the rails, from side to side.

To the eleventh cross-interrogatory, the witness saith :

11 X. My studies and experience enable me to compare the state of railroad engineering previously to 1830 and at the present time. I have already stated my means of knowledge on the subject.

To the twelfth cross-interrogatory, the witness saith :

12 X. It is desirable that cars should run as steadily as possible, whether at low or high rates of speed. Whether the long bodied car or the eight-wheel car will run more steadily than the four-wheel car, will depend, not upon the length of the cars, but upon the mode of coupling them together in trains. I have always understood that the English railway trains, which consist of only four-wheel cars, run much steadier in their motion than our eight-wheel long cars.

To the thirteenth cross-interrogatory, the witness saith :

13 X. All cars intended for trains should be built accordingly, and to correspond with each other.

To the fourteenth cross-interrogatory, the witness saith :

14 X. In my opinion it is not important and essential to the proper working of the first car in a train that, while it is subjected to the whole draft of the train, its trucks should have the same freedom of motion that any other truck in the train has. I think that the advantages of having a proper direction given to the forward truck, by the tractive force, would much more than counterbalance the disadvantage, if any, that would be occasioned by the means of friction on the king-bolt of the first truck, by applying the draft directly to the truck.

To the fifteenth cross-interrogatory, the witness saith :

15 X. It is not essential, in order to give sufficient freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them. The best mode of draft now in use is by spring *drawn couplings*, connected to the king-bolt, or its equivalent.

To the sixteenth cross-interrogatory, the witness saith :

16 X. I have already said that the model represents, substantially, the extent of bearing required by the specification, but not by the drawing.

To the seventeenth cross-interrogatory, the witness saith :

17 X. No mode of draft is represented by the model.

To the eighteenth cross-interrogatory, the witness saith :

18 X. A peculiar mode of constructing the truck is stated in the specification as an essential part of Winans's invention.

To the nineteenth cross-interrogatory, the witness saith :

19 X. The use of springs, or their equivalent, is essential to the comfort of passengers ; but if an eight-wheel car like that of Bryant, Chapman, or Tredgold, united without springs, their introduction would not introduce any new principle of construction or mode of operation. The use of springs, as part of the frame-work of the truck, in the manner described by Winans, does embrace a new mode of operation, as compared with the rigid wheel frame. I also consider draft springs as very important to the comfort of passengers, as well as the springs attached to the spring bolster ; also the spring pedestals, and springs inside of the seats.



To the twentieth cross-interrogatory, the witness saith :

20 X. I refer to my former answer in relation to Chapman's patent. The patent, taken in connection with the drawings, show a four-wheel carriage, which contains an apparatus for locomotion. Also a six-wheel car or carriage, and describes the mode of constructing an eight-wheel carriage. I refer to page 139, and to the drawings. The draft was applied to the body. No other mode is shown or described.

To the twenty-first cross-interrogatory, the witness saith :

21 X. In the drawing of the eight-wheel car, shown in Tredgold, no mode of traction is shown; but the mode of traction by the body is shown in other parts of the work, and no other mode of traction is anywhere described or shown, so far as I know. The draw-link is represented on Plate 1st in Tredgold's book.

To the twenty-second cross-interrogatory, the witness saith :

22. The text of Tredgold, and the drawing I have referred to, and the uses and purposes for which his eight-wheel car was designed, all show plainly that the trucks swivel laterally, to conform to the curvatures of the road. I refer more particularly to pages 93, 94, 95, 179, and plate, 12, 13, 118, 119, 120, 121, 127, 130, 126, 133, 101, 173, 174, 135, 42, and 43 : other passages might be cited. These passages show the uses and construction of the car, and the general description of the elements of which it was made, and the circumstances under which it was designed to operate.

To the twenty-third cross-interrogatory, the witness saith :

23 X. I have already shown the essential parts in which Winans agrees with and differs from Allen.

To the twenty-fourth cross-interrogatory, the witness saith :

24 X. I have already answered this question in my direct examination, and have stated wherein Winans's resembles the Quincy car, and wherein he differs therefrom.

To the twenty-fifth cross-interrogatory, the witness saith :

25 X. A mechanic of ordinary skill, in 1829 or 1830, having knowledge of the Quincy car, or of the Allen carriage, or of Tredgold's work, or of Chapman's patent, would undoubtedly have been able, from them and without invention, to have made an eight-wheel car, which would be capable of answering the purpose of the eight-wheel car now in use. But improvements have been continually made, from that day to this, upon the eight-wheel and four-wheel cars; and the cars now in ordinary use are the result of a vast degree of experience and of many improvements, which have combined to render it safe, convenient, and useful to travellers, and to perform all its present duties.

To the twenty-sixth cross-interrogatory, the witness saith :

26 X. So far as relates to the principles of the arrangement of the eight wheels of a railway car, and their connection with the body, I consider that it is immaterial whether the wheels rotate with or upon their axes. [?]

To the twenty-seventh cross-interrogatory, the witness saith :

27 X. I do not recollect, as it is many years since I saw the cars at Quincy in actual operation; but I am informed that they draw by the trucks.

To the twenty-eighth cross-interrogatory, the witness saith :

28 X. I do not consider it a matter of indifference whether the draft is applied to the body or the truck.



To the twenty-ninth cross-interrogatory, the witness saith :

29 X. They were.

To the thirtieth cross-interrogatory, the witness saith :

30 X. I know of no instance in which the draft is represented as applied to the truck of eight-wheel cars, in any inventions existing prior to the date of Winans's patent, except the Quincy car.

To the thirty-first cross-interrogatory, the witness saith :

31 X. No works I have ever examined would teach any one that placing the wheels of the trucks very near together, would reduce the friction between the flanges of the wheels and the rails on the curves. The notion that this consequence would follow, is founded in want of experience in running cars, if not in a want of understanding the philosophy of the subject.

To the thirty-second cross-interrogatory, the witness saith :

32 X. I do not think that it is true that great steadiness of motion, when running at high velocities, is attained by constructing a car body of great length upon trucks constructed with the wheels very near together, for two reasons ; first, the trucks would be unsteady, and in passing over inequalities of surface, shock the cars as a single pair of wheels would do ; second, the great length would cause the body to vibrate too much in the centre, as has long since been proved by my experience.

To the thirty-third cross-interrogatory, the witness saith :

33 X. I do not consider that in order to move over the curves and irregularities of a railroad, at a high velocity, with safety and steadiness of motion, and with the least practicable friction on the rail, the trucks should have the greatest freedom to conform to the surface of the rails. The greatest possible freedom would be wholly incompatible with safety or with steadiness of motion, as already expressed by me in my former answers. They should have the greatest freedom which is consistent with safety and practical utility.

To the thirty-fourth cross-interrogatory, the witness saith :

34 X. Every one of the cars and carriages mentioned in my former answers, were and are capable of being run at high velocities.

To the thirty-fifth cross-interrogatory, the witness saith :

35 X. The objects or purposes which are designed to be answered in the eight-wheel cars and carriages before mentioned by me, were not only for the purpose of carrying a greater load, and thus employing a long body, distributing the weight of the load on more numerous points of support ; but to enable the cars to conform to the curvatures and irregularities of the roads, so as to carry their freight safely and smoothly, and to run with as little friction of the flanges against the rails as possible. If they had not been made for the purpose of avoiding friction on the rails, and of conveying the load smoothly, and of conforming to the curves and irregularities of the roads, they would have had eight wheels fastened immovably to one body, instead of swiveling trucks.

To the thirty-sixth cross-interrogatory, the witness saith :

36 X. I cannot recollect the dates with sufficient certainty to answer.

To the thirty-seventh cross-interrogatory, the witness saith :

37 X. I have never been employed in any way in relation to this case. I have been much annoyed at being obliged to leave my business to testify in the case. I have no interest in it whatever.

To the thirty-eighth cross-interrogatory, the witness saith :

38 X. I have no connection whatever with any railroad company.

To the thirty-ninth cross-interrogatory, the witness saith :

39 X. I have formed an opinion that Mr. Winans's patent is void for want of novelty. There are certain peculiarities in which his car differs from preceding inventions, viz., the elastic spring truck, and the bearing of all the weight on the centre of the bolster, as provided by Tredgold, also upon such a description of truck. If these changes are patentable, I have no reason to doubt their originality and combination.

To the fortieth cross-interrogatory, the witness saith :

40 X. I have not stated that I am a railroad superintendent.

To the forty-first cross-interrogatory, the witness saith :

41 X. I have not seen or heard, or had stated to me, the substance of the foregoing interrogatories.

To the additional direct interrogatories on the part of the Respondent, the witness testifies as follows :

To the first interrogatory, he saith :

1. In all the time I have been conversant with different railroads, as stated in my previous answer, Mr. Winans has never, directly or indirectly, made any complaint that the eight-wheel cars used by those roads were any infringement of his patent. He has never asked any compensation, or made any claim upon me, nor to my knowledge ; and in the only interview I can now recall, between him and myself, at the office of the Hudson River Railroad, the subject of his patent was never alluded to until his suit against the Troy and Schenectady Railroad. I never, to my best recollection, knew or heard that he had any patent relating to the running gear of the eight-wheel car.

To the second interrogatory, the witness saith :

2. I answer this question in the negative.

To the third interrogatory, the witness saith :

3. I answer this question in the negative.

To the fourth interrogatory, the witness saith :

4. I answer this question, in both its branches, in the negative.

To the fifth interrogatory, the witness saith :

5. I answer, no.

To the sixth interrogatory, the witness saith :

6. I answer, no.

To the seventh interrogatory, the witness saith :

7. Clearly not.

To the eighth interrogatory, the witness saith :

8. There is a great difference in the mechanical theory according to which Winans, in his particular specification, recommends and claims the arrangements of wheels, and the connection thereof with the body, and the theory on which the running gear of the ordinary eight-wheel car is constructed ; and such differences are in my judgment essential, because they lead to great differences in the practical operation of the trucks. Winans's theory was, to bring his wheels in each truck as near as possible, without touching ; also to place the weight of the body or load on the centre of the bolster, and to dispense with side bearings and the rigid wheel-frame, and employ instead the springs connecting the axles. The theory on which the trucks of the ordinary

eight-wheel car is constructed is, that of using a rigid wheel-frame that will keep the axles equidistant, and the wheels square on the track. The weight of the car is not, or but partially, borne on the centre bearings, and the wheels are placed much farther apart (that is, about as far apart as the width of the track,) than in Winans's plan, in order to make them run steadier, and avoid unnecessary friction.

To the ninth interrogatory, the witness saith :

9. It is not.

To the tenth interrogatory, the witness saith :

10. It is not, as I have already explained.

To the additional cross-interrogatories on the part of the Plaintiff, the witness testifies as follows :

To the first cross-interrogatory, the witness saith :

1 X. I have answered this question before.

To the second cross-interrogatory, the witness saith :

2 X. I have not sufficient personal knowledge to state.

To the third cross-interrogatory, the witness saith :

3 X. As railroads have always been constructed up to this time, it is important to obtain distribution rather than concentration of weight.

To the fourth cross-interrogatory, the witness says :

4 X. I cannot say, of my own personal knowledge.

To the fifth cross-interrogatory, the witness saith :

5 X. I cannot say, of my own personal knowledge.

To the sixth cross-interrogatory, the witness saith :

6 X. I cannot say, of my own personal knowledge.

To the seventh cross-interrogatory, the witness saith :

7 X. I designed four-wheel cars, which were first used on the Utica and Schenectady road. I also designed the first eight-wheel cars that were also built on the same road. It was in about 1839 or 1840, that I designed parts of the first eight-wheel cars.

WM. C. YOUNG.

Subscribed and sworn to before me, this Nov. 4th, 1853.

JOS. F. SABINE, *Com'r &c.*

ROSS WINANS vs. THE EASTERN RAILROAD CO.

On this 3d and 4th days of November, A. D. 1853, William C. Young, of the City, County and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, a Commissioner appointed by the Circuit Court of the United States within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories, herewith returned, at my room at St. Nicholas Hotel, in the City of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of the said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me before signing, and was then subscribed by said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 14th day of November, A. D. 1853.

JOS. F. SABINE, *Com'r.*

## DEPOSITION OF CHRISTIAN E. DETMOLD.

Christian E. Detmold, a witness on the part of the Respondents, being duly sworn, in answer to the direct interrogatories specially addressed to him, saith :

To the first interrogatory, the witness saith :

1. My name is Christian E. Detmold. I reside in Orange, New Jersey. I am a civil engineer by profession. My place of business and office is at New York. I have been connected, as engineer, with railroads and railroad machinery, from their first introduction into this country, until within the last few years. I have been connected, as engineer, with the following railroads: the Charleston and Hamburg, of South Carolina; the Charleston and Columbia, S. C. Railroad; the Providence and Stonington road, of which I was Resident Engineer, and which I built entirely; and Long Island Railroad. I built a railroad over part of the Alleghany Mountains, in Maryland, myself, nine miles long, and it is used for the transportation of coal and iron and other ores. This road has steep planes and sharp curves. Eight-wheel double-truck cars were used there. I have had the best opportunity to observe the operation of eight-wheel double-truck cars upon this road. They operate most admirably and perfectly. The length of the bodies of each car is twelve feet only. The trucks are placed entirely under the body. For years past I have been perfectly familiar with their mode of construction and operation. I have been employed by the government of the United States in the construction and repairs of the fortifications of Charleston harbor. In 1836, I was sent to Europe by several railroad companies, to have their railroad iron manufactured, and to inquire into the state of railways in England and on the continent. Afterwards I was employed by the Prussian government in making several reports upon the subject of the railways of the United States. This also led me to thorough investigation on the subject. I endeavored to develop the whole system of railroad making, including the cars and locomotives. Since that I have devoted myself to the erection of works for the manufacturing of iron, &c., and the organization and construction of machinery therefor.

To the second interrogatory, the witness saith :

2. At the present moment I have no connection with the Crystal Palace. I was the constructing engineer until it was finished. I selected the plan, and executed it from beginning to end. At the request of the Association for the Exhibition of the Industry of all nations, I became their engineer, and as such erected the New York Crystal Palace. Since then I have resumed that branch of my profession to which I have, of late years, specially devoted myself, namely, mining and metallurgy; and I am now the President of the New Jersey Zinc Company.

To the third interrogatory, the witness saith :

3. In the fall of 1828, and spring of 1829, I was in the service of the South Carolina Railroad Company, making surveys, maps, and drawings for the road. Before that I was engaged by the government at the city of Charleston, S. C., in surveys in that city.



To the fourth interrogatory, the witness saith :

4. My relation to Mr. Horatio Allen was that of assistant and special draftsman to Mr. Allen, after he became chief engineer of the road from Charleston to Hamburg, S. C.

To the fifth interrogatory, the witness saith :

5. During the winter of 1830 and 1831, under the direction of Mr. Allen, I made and assisted Mr. Allen in making drawings of the double-truck steam carriages. A portion of the original drawings are now before me, having been borrowed from Judge Nelson, before whom they are in evidence in the case of *Winans vs. Eaton* and others, as I am informed ; and a copy thereof, which I believe to be correct, is annexed to the deposition of Horatio Allen, in the present case. I therefore suppose it not necessary for me to annex another copy thereof to my answer. The drawing now before me, marked G, was made by Horatio Allen himself.

To the sixth interrogatory, the witness saith :

6. I am absolutely certain as to the date at which I assisted in making said drawings, and am enabled to fix the same by a variety of circumstances.

To the seventh interrogatory, the witness saith :

7. I have already stated that they were made under the direction of Mr. Horatio Allen.

To the eighth interrogatory, the witness saith :

8. So far as relates to the running gear with two swiveling trucks, it was invented by Mr. Allen, who also designed the general arrangements of that engine.

To the ninth interrogatory, the witness saith :

9. Before the drawings were commenced, the principles of the eight-wheel double-trucks were fully developed and explained to me by Mr. Allen, so that I then clearly understood the subject of the construction and operation of the eight-wheel double-truck railroad cars, as well as I now do. The adoption of eight-wheel engines became necessary, from the fact that the Charleston Railroad was constructed of wooden rails, with a light flat iron bar. The rails being supported on sleepers resting upon piles, at a distance of six and one half feet apart. The four-wheel engines acted very injuriously upon this light structure, because the greater part of the weight of the locomotive was at one end, and therefore the slightest irregularity in the road caused the engine to operate like a heavy hammer upon the rails, which injured both rails and engine, and produced a very unsteady and unsafe motion. The object of Mr. Allen was to make such improvements in the running gear, as to obviate these difficulties. This was done by placing two swiveling trucks under the long body of the engine. The body was very much longer than that of the ordinary four-wheel engine. About this time, but whether before or after I cannot now positively say, long timbers were habitually brought along the line of the road, to be used in its construction. These timbers were placed upon two four-wheel bearing carriages, in the following way : Each bearing carriage or truck contained four wheels, suited to pass the smallest curves of the road. On the hind truck a swiveling upper bolster was placed, with one standard on each end, for the purpose of keeping the

load in its place, and to enable the truck to swivel under it without touching the load. The front end of the load rested upon the front truck; and these long timbers formed the connection between the two trucks. Afterwards, the loads of timber were supported upon two trucks, both having swiveling bolsters; but I cannot fix the exact time when these were first introduced.

To the tenth interrogatory, the witness saith:

10. The first engine built and put into operation, as inquired of, was the "South Carolina." She was constructed at the West Point Foundry, in 1831; received at Charleston in January, 1832; put in operation in February, 1832. Three others were also constructed and put in operation before the end of 1832. Those engines, so far as the running gear was concerned, all answered admirably the purposes for which they were built, and had the advantages over the former four-wheel engine, of distributing the weight of the locomotive over a larger surface of rails, and over more points of support, and by the double swiveling trucks, that of conforming to all the irregularities and curvatures of the roads, and of far greater evenness and steadiness of motion, when running at high speed, and saving injury to the rails and engines, by avoiding the hammering I have mentioned. After they had been running some years the difficulty of making sufficient steam became such, that the engines were superseded, but not owing to any defect in the running gear.

To the eleventh interrogatory, the witness saith:

11. The object was to obtain a small amount of pressure on each wheel, while the body carried was increased in length and weight, and to give the two trucks a proper action to conform to the curves and other inequalities of the road, and, at the same time, to cause the body of the steam carriage to run more smoothly or steadily on the road than the four-wheel steam carriages previously in use; and also to transport more freight and passengers, and run with more ease, safety, and economy, both as to the train and to the road.

Mr. Horatio Allen, in the winter of 1830 and 1831, as I have before said, made some of the drawings himself, and the drawing marked G, and signed by me, is one of the drawings, showing parts of the steam carriage. It is the end view, side view, and ground plan of the trucks. In this drawing, letter I, marked on the end view, is the pintle or centre pivot, on which the trucks turned, to suit the curves of the road. This centre pivot is shown in that view, passing through the upper iron bolster that is secured to the body of the carriage; and this centre pivot turns with the four-wheel truck under this upper bolster, which has friction-roller side-bearings also, resting on the lower bolster, which is part of the wheel-frame of the truck. The lower or truck bolster is made of wood, is very strong, and has a centre pivot to pass with its stem through it, and it is securely bolted in the middle of the length of this lower bolster. In the ground plan of the truck, letter O shows the top of the centre pivot or pintle in the middle of the lower truck or bolster. In the side view, letter P shows the pedestals, with their springs securely fastened to the rigid and strong wooden truck-frame, to hold the wheel axles parallel to each other and the truck square in running on the curves as well as the straight track. Two of these four-wheel

trucks supported the long body of the steam carriage, by means of the bolsters and centre pivots, which allowed the trucks to turn and conform to the curves and other inequalities of the road. The two trucks acted independent of each other. The inside pair of wheels in each truck were also made driving wheels, which, at the same time, allowed the trucks to conform with proper ease to both the vertical and horizontal inequalities of the road, which, of course, includes the curves. The whole of this steam carriage, with these trucks and bolsters, and centre pivots, as devised and drawn in the winter of 1830 and 1831, and as exhibited by a side view of the carriage, which was constructed in 1831, at the West Point Foundry, and was in operation on the road in South Carolina in February, 1832, is shown in the drawing marked H, and signed by me, and the drawing G, true copies of which are annexed to the deposition of Horatio Allen; the original being in Court, as above stated. The operation of the combination of these long bodied carriages with the two four-wheel trucks, with bolsters and centre pivots, and side bearings, and pedestals, and springs, and rigid wheel-frame holding the axles parallel and the truck wheels square, was perfect in conforming to the curves and all other inequalities of the road. I frequently rode on them. The trucks gave great ease of motion and steadiness to the body of the engine—much greater than existed with the four-wheel steam carriages that were previously used on the road. The superior steadiness and ease of motion of these engines was a frequent subject of remark and conversation between Mr. Allen and myself, and was even a source of congratulation amidst the difficulties experienced with these engines, but which difficulties had no connection with, or were in nowise owing to the arrangement of the running gear. From the time these eight-wheel steam carriages were invented and the drawings made, in the winter of 1830 and 1831, showing them completely organized, until they were completed, and running on the road, no laches or delay whatever occurred; but the matter was prosecuted to a successful practical use of them on the road, in 1832, with all due diligence.

To the twelfth interrogatory, the witness saith:

12. In the spring of 1831, in the month of May, Mr. Allen sent a communication to the President and Directors of the South Carolina Railroad Company, on the subject of this eight-wheel steam carriage, of which drawings were made in the winter previous, as I have stated; which communication, describing the carriage in general terms, was printed and published in 1831, in Charleston. I recollect that communication perfectly well; and Mr. Allen obtained leave to construct the carriages. He accordingly left Charleston early in the summer of 1831, I think in the month of June, for the North, and contracted with the West Point Foundry for the construction of the steam carriages on this plan. The original report, I am informed, is filed in the case of *Winans vs. Eaton* and others.

To the thirteenth interrogatory, the witness saith:

13. I believe that my former answers sufficiently answer this inquiry.

To the fourteenth interrogatory, the witness saith:

14. In my opinion it was not. The steam carriage was so constructed as to allow the trucks to swivel to the curvatures and unequal-



ities of the road; and the only change that was necessary to pass from the steam carriage to the eight-wheel car, was, as above stated, merely to put a platform or body upon the frame, under which the trucks swiveled, instead of the engine. The car would then embody the same principles of construction and operation as an eight-wheel double-truck car, drawn by the king-bolts.

To the fifteenth interrogatory, the witness saith :

15. These steam carriages contain the same substantial combination of two four-wheeled trucks and long carriage body, connected by means of centre pivots and bolsters, as the eight-wheel carriages or cars for transporting freight and passengers on the roads, now in use on the railroads generally. These carriages, like the South Carolina, and the original drawing, G, also have rigid wheel frames and pedestals and springs, to properly control and regulate the action of the wheels in running on the road. In every essential respect, and particularly in the substantial character of the combination of the body with the trucks, the eight-wheel cars now used generally, and the eight-wheeled steam carriage, of which Mr. Allen and myself, under his directions, made the drawings, in the winter of 1830 and '31, are the same. Putting a box or seats on the steam carriage, for passengers, and making it a steam passenger coach; or removing the boiler, and setting a box on the upper bolsters, for passengers to sit in, does not alter the substantial character of the combination, and does not produce a new invention. It would still be the same substantial combination of a long carriage body, connected to two four-wheeled trucks, by bolsters and centre pivots, with side bearings, to conform to the curves and follow the track with ease and safety; and develops in both cases the same principles of operation and the same advantages, both to the road and the carriage body. The distance of the wheels apart in each truck of the original drawing, and of the steam carriages, was twelve inches. The ball-joint connection between the connecting rod and the axle of the driving wheels, was such as not to impede the freedom of the swiveling of the trucks; and I do not consider that the fact that one pair of wheels in each truck were employed as driving wheels, would introduce any difference of practical importance in the operation of the trucks. They were each free to conform to the curvatures of the road, and so are the trucks in common use.

To the cross-interrogatories to this witness, on the part of the Plaintiff, he answers as follows :

To the first cross-interrogatory, the witness saith :

1 X. By the words "principle of the eight-wheel passenger car," I mean that peculiar arrangement and combination of parts embodied in the organization of the eight-wheel car, with two swiveling trucks under the body, as contradistinguished from that of the ordinary four-wheel car. It is what makes the essential difference between them.

To the second cross-interrogatory, the witness saith :

2 X. In my answers to the eleventh and fifteenth direct interrogatories, and to the first cross interrogatory, I have fully stated what I consider to be the principle of the double-truck steam carriage.

To the third cross-interrogatory, the witness saith :



3 X. I have never seen, heard, or had stated to me, the substance of any of the foregoing interrogatories prior to my present examination.

C. E. DETMOLD.

Subscribed and sworn to before me, this November 8th, 1853.

JOS. F. SABINE, *Com'r.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 8th day of November, A.D., 1853, Christian E. Detmold, of Orange, in the County of Essex, in the State of New Jersey, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my chambers in the city of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing Commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 8th day of November, A. D., 1853.

JOS. F. SABINE, *Com'r.*

#### DEPOSITION OF EDMUND FRENCH.

Edmund French, a witness produced on the part of the Respondents, being duly sworn, for answer to the interrogatories on the part of the Respondents, saith as follows :

To the first interrogatory, the witness saith :

1. My name is Edmund French ; age, forty-seven years ; place of business, New York ; residence, Troy ; and my profession or occupation, civil engineer.

To the second interrogatory, the witness saith :

2. I have been connected with the Hudson River Railroad since its construction was commenced to the present time. I was engineer, superintendent of machinery, and once general superintendent. I was educated at West Point Military Academy, and was graduated in 1828. I served as topographical and military engineer in the army for several years.

To the third interrogatory, the witness saith :

3. I am.

To the fourth interrogatory, the witness saith :

4. I have examined a copy of said specification and letters.

To the fifth interrogatory, the witness saith :

5. I have examined the model marked B. In my judgment it is a true representation of the car described and recommended in said specification. I should construct one like it if intending to make one according to the description in the patent.

To the sixth interrogatory, the witness saith :

6. I take it for granted, that the cars on the Eastern Railroad are like those in general use on the railroads throughout the country. The essential parts of a "double-truck eight-wheel car" are: rigid truck-frames, with the wheels so far apart as to make the bearing points about equally distant with the gauge of the track upon which they are to run; a body resting upon the trucks, with a connecting pin in the centre of the truck, upon which the body and the trucks swivel or turn with side-bearings. The trucks should be placed about from five to eight feet from the end of the body, so that no injury would arise from the trucks under one car coming in contact with those in another, when two or more cars are run in one train. The body should be long enough, so that the trucks would not interfere with each other under the same body. These are the essential and elemental features; and a car constructed in this manner will run "smoothly, evenly and safely over the curves, straight track and irregularities." There are many contrivances added to these in the modern cars, but they are not elemental.

To the seventh interrogatory, the witness saith:

7. There are many improvements on the eight-wheel cars, as now used, not mentioned in Winans's specification. Among these are, side-bearings, swinging bolsters, safety beams, Babbet metal bearings, patent boxes of various kinds, brakes, modes of coupling cars in a train, spring bumpers, chilled rim solid hub wheels, pedestals with springs, india rubber springs, &c. &c., all adding, more or less, to the safety of the car and the comfort of the passenger.

To the eighth interrogatory, the witness saith:

8. Cars are so constructed. The rest of question is answered in the answer to the sixth interrogatory.

To the ninth interrogatory, the witness saith:

9. They do invariably; because it is absolutely necessary, at the present high rate of speed, to prevent the body from oscillating or rocking in passing curves, or where the load is not equally distributed in the body. They also add much to the steadiness of the truck, and their tendency is to keep them from a zigzag motion in running forward on the track.

To the tenth interrogatory, the witness saith:

10. Check chains are used, more or less, to prevent the trucks from turning round on the track, in case of accident.

To the eleventh interrogatory, the witness saith:

11. Certainly not. No invention is necessary to make the change. The same mechanical principles are developed in a body thirty feet long that are in one eighty feet long. The difference in length contains no more mere mechanical principles than there is shown in making one pair of boots an inch longer or shorter than another pair.

To the twelfth interrogatory, the witness saith:

12. Axles of the wheels connected by a spring would not be safe or practicable. Without additional support, a truck could not be used with safety. As I have stated in a previous answer, the trucks must be solid and the axles held firmly parallel to each other.

To the thirteenth interrogatory, the witness saith:

13. I have examined the drawing, and find that it does not show a

car constructed as recommended in Winans's specification. The trucks have rigid frames, and the axles are held parallel to each other, while in the specification such trucks are not recommended or described; the mode of arranging the springs; the near proximity of the flanges of the wheels in each truck; in the mode of drawing the cars, the specification not naming any mode of draft; and there are various other things shown in the drawing not mentioned in the specification.

To the fourteenth interrogatory, the witness saith:

14. I have examined the extract and drawings from the Repertory of Arts, which are attached to the commission, and now shown to me, containing the specification and drawings of the patent granted to W. and E. W. Chapman.

To the fifteenth interrogatory, the witness saith:

15. I have examined the model K, and it represents the eight-wheel car described by them. It is correct in every particular, I believe.

To the sixteenth interrogatory, the witness saith:

16. He would, without the aid of further invention.

To the seventeenth interrogatory, the witness saith:

17. It has side bearings and centre pivot, on which the trucks and body turn, and rigid wheel-frames, made according to the present generally used trucks. The frame is stout enough to retain its position and withstand the numerous strains made upon it when the car is in motion.

To the eighteenth interrogatory, the witness saith:

18. They are, according to measurement.

To the nineteenth interrogatory, the witness saith:

19. It may, by substituting a single axle for one of the trucks.

To the twentieth interrogatory, the witness saith:

20. I have examined a copy of said treatise, now shown me, and attached to the commission. I have found in them both a description and a drawing of an eight-wheel car.

To the twenty-first interrogatory, the witness saith:

21. It has a long body with two four-wheel trucks, the axles held parallel and the wheels square, one placed under each end of the body, with a centre pin or bolt in the middle of the truck, that allows the trucks to turn and the car to conform to all the irregularities of a railroad.

To the twenty-second interrogatory, the witness saith:

22. Model A is a correct representation of the Tredgold car, but model C is not. It does not swivel or turn, but only rocks. It could not conform to all the irregularities of a railroad, and could not be run on one.

To the twenty-third interrogatory, the witness saith:

23. The trucks of the Tredgold car are precisely such, in their general features, as those now in general use on railroads; that is, the axles are held parallel and rigid, so that they cannot contract or expand, as they would if coupled only by a spring; the bearing points of the wheels are about the same distance apart as the gauge or width of the track. They are connected to the body by bolsters, with a king-bolt or pintle, which allows of a swiveling motion, and enables the car to move smoothly and safely on the track. Substantially it contains

the identical mechanical principles and mode of operation of the eight-wheel cars now in general use.

To the twenty-fourth interrogatory, the witness saith :

24. It is ; and would answer better to run on a railroad than a car constructed after the recommendation in Winans's specification, because the truck is a rigid and solid one, instead of being flexible like his.

To the twenty-fifth interrogatory, the witness saith :

25. I have. The drawing shows ample to enable a car builder of ordinary skill, to construct and put together a car like those now in general use in the United States, without invention. It shows the centre bearing, being a transom plate, which has a wider surface or bearing for the bolster and body to rest upon, than is described by Winans. It has a king-bolt, allowing the trucks to swivel or turn under the body ; and the connection of the wheels with the body is similar to Winans's.

To the twenty-sixth interrogatory, the witness saith :

26. I have answered this in the last answer, with this exception : I think all the beneficial results claimed by Winans, would be had in a car constructed after Fairlamb's drawing. The two embody the same essential principles, with the exception that one has a rigid frame truck, allowing the axles to slide, and the other has an elastic truck.

To the twenty-seventh interrogatory, the witness saith :

27. I have examined the drawings of Allen's steam carriage, marked G and H, now shown to me. The mechanical principles of the construction and arrangement of the running part are precisely the same as the cars now in general use ; and it is well calculated to, and I should think could not fail to "attain the practical benefits of the eight-wheel cars now in general use." It does contain the construction and organization necessary to produce, in a much greater degree, the beneficial results stated and claimed to be accomplished in Winans's specification, of October, 1834. The free swiveling of the trucks, one truck under each end of the body, the connection of the body with the trucks, embody all the improvements claimed by Winans. I consider it a much more practical car than Winans's. It has rigid trucks, side bearings, and pedestals with springs. It would not alter the principle of the carriage or car, by taking off the large or driving wheels, and putting on those of the same size as the smaller wheels. I should think it would run more smoothly and safely on the track than the car recommended by Winans.

To the twenty-eighth interrogatory, the witness saith :

28. I have examined the model of the Bryant or Quincy car. It is constructed with two rigid trucks ; the bearing points of the wheels about as far apart as the breadth of the track. A bolster attached to the body or frame, resting on one in the truck, with a centre or transom bolt, allowing the trucks to swivel freely, with side bearings. It is well adapted to pass all inequalities and curves, to run smoothly and evenly, and operates upon the same mechanical principles with the cars now in general use.

To the twenty-ninth interrogatory, the witness saith :

29. The swiveling part of Winans's claim is contained in the Bryant car ; also the mode of connecting the body with the trucks, and supporting the body at its extreme ends. The trucks, however, are



not elastic but rigid; the wheels are not so near together as they can be without the flanges touching; and the whole body does not rest on the centre of the bolster; but the weight is borne, in part at least, on the side bearings, which makes the trucks run more steadily as well as safely.

To the thirtieth interrogatory, the witness saith:

30. He would, most certainly.

To the thirty-first interrogatory, the witness saith:

31. I have examined the works referred to at this time, and have seen in drawings made prior to 1830, four-wheel cars coupled in a train from the ends of the body, and drawn in that way.

To the thirty-second interrogatory, the witness saith:

32. The drawing in Tredgold shows that the bearing points of the wheels in each truck are about as far apart as those in general use.

To the thirty-third interrogatory, the witness saith:

33. I believe they were. I have been so informed as regards Wood's Treatise, American edition of 1832. They are shown in the Allen drawings, marked G and H.

To the thirty-fourth interrogatory, the witness saith:

34. They were; and are shown in a variety of books before 1830.

To the thirty-fifth interrogatory, the witness saith:

35. I answer these questions negatively, one and all.

To the thirty-sixth interrogatory, the witness saith:

36. It is not; for by a change in the size of the wheels the distance of the flanges apart would be changed, while the bearing points would remain the same. Altering the size of the wheels would not change the mechanical principles.

To the thirty-seventh interrogatory, the witness saith:

37. It is; for when the bearing points are too near, the truck does not run as steady, and is more likely to get off the track. When the wheels of the truck are brought so closely as to make the truck act like a single pair of wheels, it is practically of no use, as it would not be safe to run on a railroad at a high rate of speed. I would not suffer such a truck to run on the Hudson River road. Under the locomotives which are now being made for our road, the wheels in the forward truck are extended further apart than the width of the track. I find the trucks run more steadily, and with less oscillation, when the bearing points of the wheels are even wider than the width of the track—say from 5 to 5 1-2 feet apart.

To the thirty-eighth interrogatory, the witness saith:

38. It is. It presents unnecessary friction, and the trucks from climbing the rail when they come in contact with any obstruction upon or depression in the track, and the car being thrown off. They must be parallel and fixed.

To the thirty-ninth interrogatory, the witness saith:

39. I do not now recollect of anything.

To the fortieth interrogatory, the witness saith:

40. I have answered this question in my preceding answers. A flexible truck, like the one recommended by Winans, could not be used safely on a railroad. His mode of arranging the eight-wheel car is the same practised by others previous to 1830. My opinion and theory is founded upon observation and experience.

To the cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

To the first cross-interrogatory, the witness saith :

1 X. I have answered this in the answer to the first direct interrogatory.

To the second cross-interrogatory, the witness saith :

2 X. I have. My experience I have given in the answer to the second direct interrogatory.

To the third cross-interrogatory, the witness saith :

3 X. I have not.

To the fourth cross-interrogatory, the witness saith :

4 X. I have been accustomed to the examination and comparison of machinery, with the view of forming an opinion of its merits and identity, for many years.

To the fifth cross-interrogatory, the witness saith :

5 X. It has.

To the sixth cross-interrogatory, the witness saith :

6 X. I am : and I think I do.

To the seventh cross-interrogatory, the witness saith :

7 X. It is important that cars should move round curves with as little friction as possible ; and it is equally if not more important that they should move on the straight line of a road with as little friction as possible. I would not overlook the friction on the straight track to avoid it on curves, when not more than one tenth part of the road was curved. A truck or car should be constructed with reference to all the duties it has to perform, and should be made to run with as little oscillation and wobbling as possible. The more steady a truck runs the more safe is the car.

To the eighth cross-interrogatory, the witness saith :

8 X. It will.

To the ninth cross-interrogatory, the witness saith :

9 X. It will not ; as experience has demonstrated to every railroad man who has watched the operation of cars.

To the tenth cross-interrogatory, the witness saith :

10 X. It will not ; unless the springs, as prepared by Winans, could be used safely, and the axles would be restrained to parallelism when on the straight and even part of the track ; but I do not think that could be done.

To the eleventh cross-interrogatory, the witness saith :

11 X. I believe I am. My means of knowledge are—reading, experience, intercourse with others engaged in the same pursuits.

To the twelfth cross-interrogatory, the witness saith :

12 X. The four-wheel cars run as steadily, I believe, as the eight-wheel cars. There may be, and undoubtedly is, more jarring in the body of a four-wheel car, than in an eight-wheel car, for the jolt or shock is not taken off through the king-bolt connection, as in the eight-wheel double-truck swiveling cars. I understand they are used in England, on most of the roads, where as high rates of speed are reached as in this country ; and I have never heard any complaint about the unsteadiness of their cars. I do not consider that great length of body is essential to the attainment of greater steadiness of motion, at high velocities, than could be attained by the four-wheel cars, as formerly constructed. I

think a truck constructed after the fashion of the four-wheel cars, and placed under a long body, will run much steadier on the track than one constructed according to Winans's specification.

To the thirteenth cross-interrogatory, the witness saith :

13 X. It is, as cars are now used generally.

To the fourteenth cross-interrogatory, the witness saith :

14 X. It is not. The hind truck in a train has more freedom than any other, and the car runs more unsteady than any other ; it has too much freedom.

To the fifteenth cross-interrogatory, the witness saith :

15 X. It is not. Many if not most of the cars now in use are drawn by the king-bolt.

To the sixteenth cross-interrogatory, the witness saith :

16 X. It does. The drawing and patent do not differ materially. The drawing shows, if any thing, a little more bearing on the king-bolt than is recommended in the patent.

To the seventeenth cross-interrogatory, the witness saith :

17 X. Model B does not. None is stated or described in the patent.

To the eighteenth cross-interrogatory, the witness saith :

18 X. It is. He recommends, particularly, the use of a spring to connect and hold the axles, instead of a frame. He also seems to lay great stress on the near proximity of the wheels, for, in the last part of his specification, he says, that the end he has in view may "be attained by constructing the bearing carriage in any of the modes usually practised, provided that the fore and hind wheel of each of them be placed very near together." He also says that the "two wheels on either side of one of the bearing carriages may, from their proximity, be considered as acting like a single wheel." He also seems to consider the resting of the body on the centre of the bolster an important feature of his invention. These three features, above enumerated, are the ones which distinguish his patent for an eight-wheel car from the others that preceded him ; and none of which are now used by the railroads of the United States. Experience has shown them all to be unsafe and impracticable.

To the nineteenth cross-interrogatory, the witness saith :

19 X. I do, if ease of motion is required, but not springs applied, as recommended by Winans. Those in the Allen drawing are far superior for practical utility.

To the twentieth cross-interrogatory, the witness saith :

20 X. It does. The description clearly points out just such a car as is represented in model K. His drawing represents a four-wheel car, and a six-wheel car, and a truck under one end, with a king-bolt in the centre and side bearings ; and the specification says that if the weight of the load should require eight wheels, "it is only requisite to substitute, in place of the axis 1, 1, a transom, such as is described (laying the weight equably upon both), and these swiveling to two coal waggons, attached together, the whole four pair of wheels will arrange themselves to the curves of the railway." The draft appears to be from the body.

To the twenty-first cross-interrogatory, the witness saith :

21 X. There is not.

To the twenty-second cross-interrogatory, the witness saith :

22 X. There is, both in the drawing and description, on page 179.

To the twenty-third cross-interrogatory, the witness saith :

23 X. The Allen car is substantially described by Winans, on page 4 of his specification, where he says, "I construct two bearing carriages, each with four-wheels, which are to sustain the body of the passenger or other car, by placing one of them at or near each end of it," &c., down to the close of the paragraph, with these exceptions: in Allen's car the axles are not connected by springs, but are held rigidly by a stout wood frame. It also has side bearings, and the wheels are not as close together as they can be. The bearing points are as far apart as the width of the track; but both are swiveling trucks, and are intended to accomplish the same results. They differ in details only.

To the twenty-fourth cross-interrogatory, the witness saith :

24 X. I would give the same answer to this question that I have given to the last preceding one.

To the twenty-fifth cross-interrogatory, the witness saith :

25 X. He would. He might not have known results at that time as well as they are now known, after twenty years' additional experience, it is true; but he could, without invention, have constructed cars, in 1829 or 1830, with Chapman's specification and drawing, Tredgold's treatise, Bryant's car, and Allen's steam carriage before him. An intelligent mechanic, on looking at either of those cars, would have seen that they would swivel and conform to the curves and inequalities of the road, run smoothly and safely, and accommodate the business that was to be done on them. They not only distributed the weight upon the road—a very desirable consideration in the expenses of a railroad, but they run smoothly, and would accomplish all the objects set forth in Winans's specification.

To the twenty-sixth cross-interrogatory, the witness saith :

26 X. They are, as far as relates to the principle of arranging the eight wheels of a car, and the connection with the body. There would be no difference whether the wheels rotated upon or with the axle.

To the twenty-seventh cross-interrogatory, the witness saith :

27 X. I know they drew by the trucks.

To the twenty-eighth cross-interrogatory, the witness saith :

28 X. It is not a matter of indifference. Both ways have their advantages.

To the twenty-ninth cross-interrogatory, the witness saith :

29 X. They were, and so I have before stated.

To the thirtieth cross-interrogatory, the witness saith :

30 X. No, sir. Chapman's car is an instance to the contrary. The car is represented in the drawing to be drawn by the body, and not by the truck.

To the thirty-first cross-interrogatory, the witness saith :

31 X. They would not; and nothing in railroad experience up to this period would teach them so. It is not true that "placing the wheels of the truck very near together would reduce the friction between the flanges and rails over curves." That was one of the theories put forth in Winans's specification, which was unsound, and shows that he did not understand the proper construction of cars.

To the thirty-second cross-interrogatory, the witness saith :

32 X. Great stability of motion, when running at high rates of speed, is not attained by "great length of car body," supported upon trucks, at



or near each end. Cars of too great length do not run as steadily or smoothly as those shorter.

To the thirty-third cross-interrogatory, the witness saith :

33 X. Trucks should not have the greatest possible freedom to produce stability of motion. They should be steady, and not have too much wobbling.

To the fourteenth cross-interrogatory, the witness saith :

34 X. I have, in my previous answers, described such cars as are best adapted to high rates of speed.

To the thirty-fifth interrogatory, the witness saith :

35 X. It is not. The Chapman, Tredgold, and Bryant car, and the Allen steam carriage, are all instances to the contrary. While one of their objects was to distribute the weight over a greater surface of road, another, and equally as important one, was to increase their capacity and have them run smoothly and evenly upon the track, so as to avoid injury and inconvenience to persons and property transported, and to prevent unnecessary wear of road and destruction of machinery, and by their swiveling motion to conform with ease to the curves, elevations, and depressions of roads.

To the thirty-sixth cross-interrogatory, the witness saith :

36 X. I cannot say for what purposes they were employed, except the Quincy car. Their capacity, principle of construction, and mechanical operation, fitted them for passenger as well as for burthen cars. A box or car body on the Quincy car and Allen carriage, in the place of the timber frames and boiler which are represented on them, was all that was necessary to make them good passenger cars. The loads transported upon them might have been subdivided.

To the thirty-seventh cross-interrogatory, the witness saith :

37 X. I have not; and am in no way, except as a witness, connected with this case.

To the thirty-eighth cross-interrogatory, the witness saith :

38 X. I am Superintendent of the Hudson River Railroad, which uses eight-wheel cars.

To the thirty-ninth cross-interrogatory, the witness saith :

39 X. I have not formed such an opinion.

To the fortieth cross-interrogatory, the witness saith :

40 X. I am not a member of any railroad association. I have had nothing to do with this case, as stated in the previous answer.

To the forty-first cross-interrogatory, the witness saith :

41 X. I have not seen or heard them stated, until shown to me by the Commissioner.

To the further direct interrogatories on the part of the Respondents, the witness answers as follows :

To the first further interrogatory, he saith :

1. I do not.

To the second further interrogatory, he saith :

2. Larger bodies, applied to either of those cars, would not introduce any new principle of mechanism, or any new mode of operation. It is clear that Winans, when he drew his specification, did not describe or contemplate cars as long as those now in use; for he says "the

body of the passenger or other car, I make of double the ordinary length of those which run on four wheels, and capable of carrying double their loads."

To the third further interrogatory, he saith :

3. It certainly would not.

To the fourth further interrogatory, he saith :

4. There is not.

To the fifth further interrogatory, he saith :

5. I answer in the same way.

To the sixth further interrogatory, he saith :

6. And to this the same answer.

To the seventh further interrogatory, he saith :

7. I do not consider that placing the trucks further apart, by putting on a longer body, would have changed the essential action of the car, and there is nothing that I can discover which would make it necessary that the wheels should be equidistant from each other. The principles of mechanism in its construction or operation would not be varied by the changes suggested.

To the eighth further interrogatory, he saith :

8. There is an essential difference between the mechanical theory of Winans, and that now employed in the construction of cars ; and that difference has been described fully in my previous answers.

To the ninth further interrogatory, he saith :

9. Most certainly not. The purposes claimed do not depend upon the great length of body, by any means.

To the tenth further interrogatory, he saith :

10. I have answered this question in my previous answers.

To the further cross-interrogatories, on the part of the Plaintiff, the witness answers as follows :

To the first further cross-interrogatory, he saith :

1 X. I consider the theory of Winans to be : connecting the axles and wheels in each truck by a flexible spring, which of necessity would allow the wheels to be wrenched or twisted out of square ; to rest the body of the car on a small space at or around the king-bolt ; and to bring the wheels in each truck so close together that they would act like a single wheel ; and placing each truck under or at the extreme end of the body. This is his theory, if I understand it.

To the second further cross-interrogatory, he saith :

2 X. I cannot say what the average rate of speed was. They were used for passengers and freight.

To the third further cross-interrogatory, he saith :

3 X. They were so constructed, prior to 1830, and are so at this day.

To the fourth further cross-interrogatory, he saith :

4 X. I have understood there were two : the Liverpool and Manchester, and the Stockton and Darlington.

To the fifth further cross-interrogatory, he saith :

5 X. It was, most generally ; but some roads had introduced locomotives with success.

To the sixth further cross-interrogatory, he saith :

6 X. I am unable to say positively.

To the seventh further cross-interrogatory, he saith:

7 X. I have not. E. FRENCH, *Gen. Supt. H. R. R. R.*

Subscribed and sworn before me, this Dec. 1, 1853.

JOS. F. SABINE, *Commissioner, &c.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 1st day of December, A. D. 1853, Edmund French, of the City of Troy, in the County of Rensselaer, and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States, within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my rooms, in St. Nicholas Hotel, in the City of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of the said Court. And the foregoing deposition, given by him in my presence, was reduced to writing, by me, before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 17th day of December, A. D. 1853.

JOS. F. SABINE, *Commissioner.*

DEPOSITION OF CHARLES MINOT.

Charles Minot, a witness for the Respondents, being duly sworn, in answer to the direct interrogatories, to him specially addressed, saith:

To the first interrogatory, the witness saith:

1. My name is Charles Minot; my age is forty-three years; my residence is in the City of New York. My business is that of Superintendent of the New York and Erie Railroad, and has been so since May, 1850. For more than nine years previous to that time, I was Superintendent of the Boston and Maine Railroad, while I was residing in Massachusetts.

To the second interrogatory, the witness saith:

2. It has been my constant habit, from the necessity of my business, to examine the eight-wheel cars in general use on railroads; and I have a familiar knowledge of them in all their details.

To the third interrogatory, the witness saith:

3. I am acquainted with Mr. Ross Winans, and have been so for several years past.

To the fourth interrogatory, the witness saith:

4. Mr. Winans, of Baltimore, was at the depot of the Boston and Maine Railroad, while I was superintendent. In the year 1850 he was trying an eight-wheeled coal-burning locomotive, for hauling freight on the Boston and Maine Railroad, of which I was at the time Superintendent. I had been acquainted with Ross Winans before that time; and at that time my office was in the upper part of the passenger depot, in which the eight-wheeled passenger cars ran and stood every day; many of these cars were always in the depot; and Ross

Winans was there daily, while trying the experiments, and saw these eight-wheel cars, and saw and conversed with me on very many railroad subjects. These cars had two four-wheel trucks with wheel-frames, in the usual manner, swiveling or turning on centre pivots, under a long body; and he, Ross Winans, never mentioned to me that he claimed to have a patent for these cars, and never made any claim from me or the company, to my knowledge, in relation to them, nor the freight cars. I did not know at that time, to the best of my recollection, that he had a patent upon, or purporting to be for, an eight-wheel car of any sort of construction.

To the fifth interrogatory, the witness saith :

5. While Mr. Winans was trying his experiments on the coal-burning locomotive, he was frequently riding upon trains of the ordinary eight-wheel cars for freight, which were the same, except as to the swinging bolster, as the passenger cars in their running gear. He was in their presence all the time he was in and about the depot or on the road.

To the sixth interrogatory, the witness saith :

6. The eight-wheel cars inquired about were the same as those in general use, and in use on the Eastern Railroad.

To the seventh interrogatory, the witness saith :

7. I have examined the specification of Ross Winans's patent, of October 1st, 1834, and understand the same; and the model B is a true representation of the mode of construction of the car described by his specification. I have known Ross Winans several years, and have had frequent conversation with him on railroad matters generally. In some of my conversations with him, of late years, he stated that he had a great many patents, and never realized much from them; that he was going to take a new course in future; but that he was not going to litigate them at his own expense.

To the eighth interrogatory, the witness saith :

8. In conversation with regard to his eight-wheel car patent, since I came to New York, he gave me to understand that he was not much interested in the suits under it; and that he had agreed with other parties at Albany, that they should prosecute the suits, and if there was nothing got out of it, that he, Winans, was to be at no expense, that the other parties were to pay the expense, and, if anything was made out of it, that they were to have a share.

To the ninth interrogatory, the witness saith :

9. After this I received a circular from Charles D. Gould, of Albany, and J. A. Spencer, of Utica, claiming the right to compensation for the using of eight-wheel cars on the New York and Erie Railroad; alleging that they were an infringement of Ross Winans's patent, of October 1, 1834. This circular was signed by said Gould, of Albany, in his own name, and not as agent or attorney of Winans, but stating that he was authorised to settle and adjust all matters in relation to the past use of the car, and to convey the right to the future use. The letter was also countersigned by J. A. Spencer, of Utica, as attorney and counsel for Ross Winans.

To the tenth interrogatory, the witness saith :

10. After I received this circular from Mr. Gould and Mr. Spencer, I conversed with Mr. Winans about it; but he said that Gould was man-



aging the matter, and was interested in it. Mr. Winans did not request any settlement with us or our company, nor, so far as I know, any allowance of any kind; and dropped the subject of the eight-wheel car, and of his patent, and never again alluded to it in my presence, to my recollection, although he knew that the Erie road were then using, and had long used the same, or similar eight-wheel cars. I understood from the conversation that, having made sale of the patent to Mr. Gould, he, Winans, had little interest in the matter.

To the printed interrogatories addressed to the witnesses generally, the witness answers as follows :

To the first interrogatory, the witness saith :

1. I have previously answered this question.

To the second interrogatory, the witness saith :

2. My opportunity for becoming practically and theoretically acquainted with the principles of machinery, and particularly of railroad machinery, has been in consequence of making these subjects my sole business for many years.

To the third interrogatory, the witness saith :

3. I consider myself familiar with both.

To the fourth interrogatory, the witness saith :

4. I have.

To the fifth interrogatory, the witness saith :

5. I have examined model B. It is a true exhibition of the mode of arranging the eight-wheels and connecting them with a car body, according to the specification.

To the sixth interrogatory, the witness saith :

6. The essential parts are, two swiveling trucks and one car body. The combination of parts that is essential is, that the two trucks shall be so connected with the body as to give it a proper support, and at the same time so as to give them sufficient freedom of swiveling motion as to allow them to pass all parts of the road. The arrangement of the parts, or their proportions in distance, may be greatly varied without the adding or taking away, or essentially varying, any one of the mechanical principles of the organization or action; and so in like manner may the details of the construction or connection of its parts or members be varied. Many devices coincide in the cars in common use in the United States and on the Erie Railroad, in enabling those cars to run smoothly, evenly and safely beyond those above stated, and which I have viewed as essential and elemental.

To the seventh interrogatory, the witness saith :

7. The eight-wheel car, as now used, has been the subject of a constant attention on the part of mechanical engineers, and is the result of many improvements upon such eight-wheel cars as were built and used from 1835 to 1840. Many inventions which were thought well of, have been tried and abandoned; and those which are now used are, in general, only such as have stood the test of experience. And arrangements of parts, and improvements in details, have been continually the subject of experiment and observation. The eight-wheel car contains some fifteen or twenty inventions or improvements, not described or suggested in the specification, and probably but few of them were known at the time it was drawn.

To the eighth interrogatory, the witness saith :

8. They are so constructed, and the trucks are usually placed about seven feet from the end of the platform.

To the ninth interrogatory, the witness saith :

9. All cars now used on any railroads that I know any thing about, have side bearings to support the body, under or near the side timbers of the framing, for the sake of strength, to govern the otherwise too impetuous swiveling of the trucks, and to spread the supports of the body as wide apart as may be, to resist the effect of the centrifugal force of the body in passing curves, and keep it steady on the straight track, and free from vibrations and swaying motions.

To the tenth interrogatory, the witness saith :

10. They are used to prevent the trucks from having absolute freedom of swiveling round in case of accident, and to sustain one corner of the truck in case of breaking the axle or wheel.

To the eleventh interrogatory, the witness saith :

11. Neither the one or the other. The dynamical laws which govern the action of the combinations of the several parts, and their natural relations, will still be precisely the same, whether the length of the body is increased or diminished ; provided that the body be not so short that the trucks interfere, nor so long as to be unwieldy or useless.

To the twelfth interrogatory, the witness saith :

12. I have examined the mode of constructing the truck, described in the specification, with long springs of steel. From my experience in the use of steel springs upon railroad cars and locomotives, I should think such a truck altogether too dangerous to be put to practical use, for various reasons : a spring cannot safely be so used in a truck, but that, in case of breaking, it will inevitably let down the load in such a manner as to be likely to produce a destruction of the car ; nor should it be used where it will be subject to extraordinary or sudden strains or twists, nor where the action upon it is received or delivered in any other direction than one which coincides with the line in which it was intended and constructed to yield. It should not be so fastened and connected at its two ends, that the action of the body to be sustained will at times tend to separate or draw together the other parts of the structure, which should be kept at a fixed distance from each other. It should not be so united with the boxes of the axles that the application of a brake must tend at all times to rupture the spring at its weakest part. Springs should not be used in such a way as that their vibrations, uncontrolled by side bearings, would often coincide with the vibrations of the car or truck, so as to produce a surging or tipping motion. They should not be used where their sudden re-action would have a direct tendency to throw the truck off the track, as in passing curves. All these difficulties are inherent in the mode of using springs as described in the specification.

To the thirteenth interrogatory, the witness saith :

13. There are wide differences between the specification and drawing. A car builder following the one would build a very different car from that which is described in the other.

The chief differences that now occur to me consist in the changes and additions relating to the wheel frames, and their materials and modes of construction ; the mode of using springs ; the position of the bolsters ;

the nearness of the flanges of the wheels; the swiveling apparatus; the traction of the car by the body; the application and arrangements for brakes, &c., &c.

To the fourteenth interrogatory, the witness saith :

14. I have examined Chapman's patent and drawings.

To the fifteenth interrogatory, the witness saith :

15. I have examined model K. It truly represents the running gear of an eight-wheel car described in that patent.

To the sixteenth interrogatory, the witness saith :

16. Undoubtedly he would.

To the seventeenth interrogatory, the witness saith :

17. They are all there.

To the eighteenth interrogatory, the witness saith :

18. It is.

To the nineteenth interrogatory, the witness saith :

19. It may, by changing the near truck for a single axle.

To the twentieth interrogatory, the witness saith :

20. I have examined Tredgold's treatise and plates, and do there find a description and drawing of an eight-wheel double-truck car.

To the twenty-first interrogatory, the witness saith :

21. Tredgold's description, taken in connection with the drawings, represent an eight-wheel car, having a body about twenty feet long, assuming the diameter of the wheels to be, as suggested in the treatise, of the common size of coal waggon wheels. The body will be about the same length as that recommended in the patent of Mr. Winans, viz., about twice the length of the ordinary four-wheel cars, which were about ten or twelve feet long. There are placed under the body two swiveling trucks of four wheels each, united into trucks by square wooden frames, and united to the body by a vertical axis or swiveling pin or king-bolt, revolving in a socket or thimble, so as to allow the truck to swivel laterally, and conform to all the inequalities, irregularities, curvatures and straight sections of railroads, such as are described by the author.

To the twenty-second interrogatory, the witness saith :

22. The model A is a correct representation of said eight-wheel car ; but model C is not ; nor does it represent any car described by the author, because the trucks do not swivel laterally, but only horizontally.

To the twenty-third interrogatory, the witness saith :

23. Their mechanical principles and mode of operation are the same, though there are some differences in the proportions of their parts.

To the twenty-fourth interrogatory, the witness saith :

24. I think a car constructed like that described in Tredgold's work, so far as the running gear is concerned, is calculated to accomplish the purposes and objects set forth in the specification as designed to be accomplished by the patentee. But Tredgold avoids some important errors into which Winans has fallen.

To the twenty-fifth interrogatory, the witness saith :

25. I have examined Fairlamb's patent. It introduces the principles of the running gear of all eight-wheel cars, including Winans's ; but it differs from all in some of its details.

To the twenty-sixth interrogatory, the witness saith :

26. I answer all parts of the question in the affirmative; but in order to make a practical working eight-wheel car, some changes of detail would be requisite; one is, to omit the improvement claimed by Fairlamb; and the too near proximity of the wheels, and the bearing on the centre recommended by Winans, and restore the square solid wheel-frames, with wheels further apart, as was shown in Chapman and Tredgold; and then these results would be much better attained.

To the twenty-seventh interrogatory, the witness saith :

27. I have examined the model and drawings of the Allen steam carriage; and after having carefully considered its construction and action, I am of the opinion that the construction and operation of the running gear is substantially, and to all practical purposes, the same as those of the common eight-wheel cars; and it is calculated to answer the same purpose, and to attain the same results that Mr. Winans desires to attain by his improvements, and which are in fact attained by the ordinary eight-wheel cars.

To the twenty-eighth interrogatory, the witness saith :

28. I have examined the model marked "G. Bryant." It is made to work, and does work, just like all other eight-wheel cars, and embraces all the essential principles of their construction and operation.

To the twenty-ninth interrogatory, the witness saith :

29. Yes, sir: all that is essential.

To the thirtieth interrogatory, the witness saith :

30. Certainly; because he would only have had to copy.

To the thirty-first interrogatory, the witness saith :

31. The mode of draft by the middle of the end of the body was commonly known long before 1830.

To the thirty-second interrogatory, the witness saith :

32. The bearings of the wheels upon the rails, as shown in these books, were rather less distant than the width of the track.

To the thirty-third interrogatory, the witness saith :

33. Yes, sir. In Allen's car and the London edition of Wood, in 1831.

To the thirty-fourth interrogatory, the witness saith :

34. To both parts, I reply affirmatively.

To the thirty-fifth interrogatory, the witness saith :

35. To these inquiries, I answer negatively.

To the thirty-sixth interrogatory, the witness saith :

36. It is not; because by enlarging the diameter of the wheels, you diminish the distance between them.

To the thirty-seventh interrogatory, the witness saith :

37. It is; since the force of the car is delivered, and the resistance of the track is felt through them alone.

To the thirty-eighth interrogatory, the witness saith :

38. To run an eight-wheel car with any proper regard to safety and security, either to the road, the car, or the passengers, it is necessary to maintain the axles at a fixed and uniform distance from each other, and the wheels square on the track. The reason is, that experience has shown that if the truck gets out of square, or the wheels are not kept at a fixed distance from each other, the trucks will catch upon the rails, and not only produce destruction of wheels and rails, and thereby



unnecessary friction, but will be in constant danger of crossing the rails. When we find the flanges badly and irregularly worn, we usually find the trucks out of square. Great pains are taken in all properly constructed trucks, to brace the frame so as to keep it in shape, and to prevent the hard and rough usage it is obliged to encounter, from getting it out of square. No slight frame will ever answer the purpose; no frame that is not braced and made very solid, so as to resist the weight of the load, the violent concussions it is subject to, as well as the action of the brakes. Even a very small variation from the square is attended with danger; and the approaching or separating of the wheels, even to a comparatively slight degree, would, according to my judgment and experience, be highly dangerous, and I should not dare to risk the actual use of a truck having such a defective arrangement.

To the thirty-ninth interrogatory, the witness saith:

39. I do not recollect any thing at this moment, my attention not being called to any particular fact.

To the fortieth interrogatory, the witness saith:

40. I have no hesitation in saying that I think the plan or theory upon which the eight-wheel cars are arranged and connected with the body, in the specification, (whether correct or not correct in the abstract,) is founded in misapprehension of the true nature and construction of the eight-wheel car; and I do not consider these theories correct in any way in which I can look at them. I am confident that if a car were constructed precisely as recommended in the patent, with no other contrivances or arrangements but those prescribed in that instrument, it would be utterly worthless; because it would be subject to the difficulties and dangers which I have stated in my former answers. No engineer would be justified in using it; nor have I ever seen such a truck applied to use under any railroad car or locomotive.

To the cross-interrogatories on the part of the plaintiff, the witness answers as follows:

To the first cross-interrogatory, the witness saith:

1 X. My experience has been derived from my connection, for more than twelve years, with the Boston and Maine Railroad in Massachusetts, and the Erie Railroad in New York; and I have, during all that time, been in the constant habit of attending to the construction and operation of railroad machinery. I have also been familiar with the principle of building and working various other description [?] of machinery.

To the second cross-interrogatory, the witness saith:

2 X. I have; as I have said in my former answers.

To the third cross-interrogatory, the witness saith:

3 X. I have been examined as an expert in one case.

To the fourth cross-interrogatory, the witness saith:

4 X. I have for many years been accustomed to the examination and comparison of railroad machinery, and to form and act upon the opinions thus formed.

To the fifth cross-interrogatory, the witness saith:

5 X. It has been a part of my duty to attend to the construction and arrangement of the running gear of railroad cars or carriages.

To the sixth cross-interrogatory, the witness saith :

6 X. I consider that I do understand the principles and properties ; and have such knowledge of the subject as will enable me to form a correct judgment.

To the seventh cross-interrogatory, the witness saith :

7 X. A well-constructed car will have as little friction as is practicable consistently with the proper construction and arrangement of all its parts.

To the eighth cross-interrogatory, the witness saith :

8 X. It will.

To the ninth cross-interrogatory, the witness saith :

9 X. It will not.

To the tenth cross-interrogatory, the witness saith :

10 X. No, sir ; you cannot make a truck that will not have unnecessary friction, if you go to extremes. The greatest freedom of motion is practically inconsistent with the least degree of friction, as is well shown in practical experience.

To the eleventh cross-interrogatory, the witness saith :

11 X. I think I am sufficiently acquainted with the state of railroad engineering at and before the date of Winans's patent, to compare the present state of railroad engineering with what then existed, so far as the running gear of cars is concerned.

To the twelfth cross-interrogatory, the witness saith :

12 X. Every improvement which will insure increased steadiness of motion of railroad cars, whether it be an advance upon what was attained in 1834, or at the present time, is important and essential to the running of cars at all rates of speed. I do not mean that attaining increased steadiness introduces a new principle into the running gear of a car ; but that such improvements are essential to the comfort of passengers. But I do not deem great length of the body essential to the attainment of greater steadiness of motion, at high velocities, than could be obtained by the four-wheel car, as formerly constructed. The length of the body is comparatively unimportant in that respect. There are numerous elements which are concerned in producing steadiness of motion, independent of its length.

To the thirteenth cross-interrogatory, the witness saith :

13 X. Yes, sir, if the car is destined to compose a part of the train.

To the fourteenth cross-interrogatory, the witness saith :

14 X. No, sir, it is not ; for if the forward trucks can conform to the curves and other irregularities of the road, there is no object in having the succeeding trucks more free than the first. I have been in the daily habit, for some years, of seeing this question practically tested.

To the fifteenth cross-interrogatory, the witness saith :

15 X. No, sir, it is not. All necessary freedom of motion of the trucks is attained when the draft is applied directly to and through the trucks. This I have ascertained by daily experience for a number of successive years, upon the trucks of the Maine Railroad. These cars were drawn by the trucks, and by a coupling connected with the forward part of the frame of the truck ; and in such a way that each truck drew all the succeeding ones in the train. I have often observed their action and operation, and I never found any difficulty or objection

to this mode of draft; and it has some advantages over other modes; that is, it gives a direction to the forward wheels of the car, which eases the friction of the flanges at times, and prevents the truck from wabbling about so much as it otherwise might do. This mode of draft was found to be safe and unobjectionable; but it was not the common mode usually employed, and it required our trucks to be built different from others; and as we found no material advantage in this mode over the one in common use, we fell into that way, and before I left the road, the common mode of draft was employed by us.

To the sixteenth cross-interrogatory, the witness saith:

16 X. Model B represents about the same amount of surface in the one as in the other; only in the model it is square, and near the centre of the bolster; in the drawing it is long and narrow, and not near the centre of the bolster.

To the seventeenth cross-interrogatory, the witness saith:

17 X. No, sir.

To the eighteenth cross-interrogatory, the witness saith:

18 X. The form of spring described in the specification is one made of leaves, the shorter ones being placed on the top of the longer ones, and adapted to the peculiar description of spring truck he there sets forth. No mode of framing is described in the patent, but the mode of constructing a truck without a frame is described. And I consider the manner of arranging and connecting the eight wheels with a railroad car, thus described, is an essential part of the invention described and claimed by Mr. Winans; though I do not mean to say that the precise form of spring there described is essential.

To the nineteenth cross-interrogatory, the witness saith:

19 X. If for passengers, it is necessary to use springs, or what is equivalent to them.

To the twentieth cross-interrogatory, the witness saith:

20 X. The drawings do not represent the whole of an eight-wheel car; they represent a truck swiveling under one end of a six-wheel car. The description gives the details of the truck, and shows how another similar truck may be placed under the other end of the same body, so as to make an eight-wheel car. The draft was applied to the body of the four-wheel car in the drawings, by means of a chain attached to a fixed point and passing over a barrel or drum upon the platform of the car; and the forward motion of the car was produced by the revolutions of that drum, which propelled the car while the drum revolved. This was the same in effect as though the draft were applied by means of a rope fastened to a fixed point in the track, and wound up by a windlass, or hauled in by a man standing upon the platform. If the same mode of draft were applied to the eight-wheel car, it would be practically equivalent to draft by the middle of the end of the platform; and its effect on the running gear would be the same. It is immaterial whether the point of draft was applied to the platform itself or to a point above the platform; since, under any circumstances, the tractive force, necessary to draw an empty or loaded car, would be so small, compared with the weight of the waggon, that it could have no effect in upsetting the waggon or car lengthwise. But if the mode of draft were applied to the eight-wheel car, as it is represented to be applied to all cars which were in use at that time in England, it would have been drawn by the

middle of the end of the body, without the intervention of the drum. The six-wheel car is not represented in the drawing as having any means of locomotion connected with it. The description refers to two trucks placed in the same manner under that same platform, or another of greater extent. It, therefore, taken in connection with the description, represents the running gear of an eight-wheel car, as above described.

To the twenty-first cross-interrogatory, the witness saith :

21 X. There is not, in the drawing on page 179, but there is in other parts of the book ; on the plates which show the four-wheel cars.

To the twenty-second cross-interrogatory, the witness saith :

22 X. The description and drawing are contained on page 179, and on plate IV, figure 26.

To the twenty-third cross-interrogatory, the witness saith :

23 X. I have not said that parts of Winans's invention are embraced in the model or drawings of Allen. What I have said is, that Allen embraces all the essential elements of all eight-wheel double-truck cars, including Winans's ; but what the invention of Winans is, I cannot undertake to say. If it consists in the peculiar construction of the truck, by spring connections between the axles of the wheels, and the bearing of all the weight of the load on the centre of the bolster, the excessive nearness of the flanges of the wheels in each truck—these peculiarities are not, by me, found in Allen's model or drawing.

To the twenty-fourth cross-interrogatory, the witness saith :

24 X. As I have said in my last answer, I cannot undertake to settle what the parts of said alleged invention are. I have said that the Quincy car contains all the essential parts and combinations of parts that are contained in all eight-wheel cars in common use, and all that is essential in Winans's, but it does not contain those peculiar features I have named in my last answer, and which make the difference between the cars in use on the Eastern road, and all other roads I know of, and the one described in the specification.

To the twenty-fifth cross-interrogatory, the witness saith :

25 X. I can see no reason why a mechanic, who knew enough to understand the principle and construction of such a car as the Tredgold or Chapman, or the Wilam engine, or the Quincy car, or the Allen engine, could fail to see and appreciate the advantages of two trucks swiveling under one body. By understanding this, he would know what the requirements and characteristics of a railroad car, for passengers or freight, must have been, to enable it to move safely and smoothly over curves, and irregularities of railroads, at any practicable rate of speed, so far as relates to the arrangement of the eight-wheels, and their connection with the body of the car. I mean to say, that he would have known, by aid of either of these inventions, how to make an eight-wheel car which would have answered all the requirements and characteristics of the eight-wheel car, in these respects. But if, by the words "requirements and characteristics," the question is intended to mean all the inventions and improvements which have contributed to the safety and ease of railroad cars, since 1830, such prior inventions, including Winans's patent also, would not have been sufficient to enable a mechanic to have discovered them. Nor are all the requirements and characteristics which a railroad passenger car must have, to enable



it to move safely and smoothly over the road, as yet known or developed, as is evident from the fact that accidents happen on the roads, attended with loss of life, which shows that entire safety is not yet attained; and the cars do not yet run so smoothly, but that it is the constant effort of machinists and inventors to develop some new characteristics, for the purpose of attaining that result in a higher degree.

To the twenty-sixth cross-interrogatory, the witness saith :

26 X. Yes, sir, I do.

To the twenty-seventh cross-interrogatory, the witness saith :

27 X. By the perches, I understand.

To the twenty-eighth cross-interrogatory, the witness saith :

28 X. I have already stated my opinions and experience on this question of draft. I cannot say that it is a matter of indifference, as each way has some advantages.

To the twenty-ninth cross-interrogatory, the witness saith :

29 X. The cars shown in the plates in Wood's treatise, and the cars shown in trains, in Tredgold and in Strickland, are four-wheel cars, with the axles attached to the body. But the car described and shown in Tredgold as an eight-wheel, was not shown as drawn by the trucks; nor was that described by Chapman shown or described as so drawn.

To the thirtieth cross-interrogatory, the witness saith :

30 X. In the Quincy car the draft is applied to the trucks, as I understand. The mode of draft in Tredgold, so far as it can be considered, as shown by reference to other drawings in the same book, that contains the eight-wheel car, is by the body; but it is not expressly shown on the plate where that car is represented. Chapman is drawn by the body; and I suppose that if a mode of draft is once shown on the same plate, it need not be repeated, in order to give a car builder to understand where the draft may be applied.

To the thirty-first cross-interrogatory, the witness saith :

31 X. I think not: these prior inventions would, however, teach a mechanic, in 1830, that it would be best to place the axes or bearing points about as far apart as they are now placed in nearly all the cars in use in this country.

To the thirty-second cross-interrogatory, the witness saith :

32 X. I should say they would not; because making the body of great length, and supporting it upon two trucks constructed as stated in the question, would not give them either stability or safety in its motions.

To the thirty-third cross-interrogatory, the witness saith :

33 X. No sir; in order to attain these objects it is absolutely necessary that the trucks should *not* have the greatest possible freedom to conform to the surface of the rails; and the trucks may be, to a certain extent, constrained by the draft, and by other means mentioned in my former answers.

To the thirty-fourth cross-interrogatory, the witness saith :

33 X. The arrangement of the eight-wheel cars, which have been described as prior inventions, were themselves such modifications and arrangements of the ordinary railroad car, as would enable them to run at high velocities, such as have been practised since 1830.

To the thirty-fifth cross-interrogatory, the witness saith :

35 X. This is one of the purposes common to these eight-wheel cars and to all other cars to be used on any railroads. But the cars and carriages of Chapman, Tredgold, Allen, Bryant, Fairlamb, are for other purposes and objects, in addition to this, and are adapted to accomplish them.

To the thirty-sixth cross-interrogatory, the witness saith :

36 X. I judge that Chapman and Tredgold were adapted to carry freight of any description, but I have no personal knowledge what they were put to.

To the thirty-seventh cross-interrogatory, the witness saith :

37 X. I have not ; and am not.

To the thirty-eighth cross-interrogatory, the witness saith :

38 X. I am superintendent of the Erie Railroad, and this company does use eight-wheel passenger and freight cars upon their road.

To the thirty-ninth cross-interrogatory, this witness saith :

39 X. I have not formed that opinion, as I think that the use of springs, in the manner described by him, was not known before his patent.

To the fortieth cross-interrogatory, the witness saith :

40 X. I am a member of an association of railroad superintendents, but I have not met with them for nearly three years last past, and know nothing of any action they may have taken in reference to the matters inquired of.

To the forty-first cross-interrogatory, the witness saith :

41 X. I have not seen, heard or had stated to me, the substance of the foregoing interrogatories or the substance of them.

To the further direct interrogatories on the part of the Defendant, the witness answers as follows :

To the first interrogatory, the witness saith :

1. I have stated what I now recollect on the subject, in a former answer :

To the second interrogatory, the witness saith :

2. It would not introduce any new principle.

To the third interrogatory, the witness saith :

3. It would not.

To the fourth interrogatory, the witness saith :

4. There is not.

To the fifth interrogatory, the witness saith :

5. I make the same answer.

In the sixth interrogatory, the witness saith :

6. I repeat the same answer.

To the seventh interrogatory, the witness saith :

7. There is nothing in the Quincy car that renders it essential that the wheels should be equidistant from each other. Nor [would the change inquired of be in any way inconsistent or incompatible with the purposes for which that car was designed or used.

To the eighth interrogatory, the witness saith :

8. There is great difference between Winans's theory and that on which the common cars are built ; and that difference is essential.

To the ninth interrogatory, the witness saith :

9. It is not.

To the tenth interrogatory, the witness saith :

10. They should not have the greatest possible freedom of swiveling, to conform to the surface of the rails. On the contrary such freedom would be inconsistent with any prudent use or control of the trucks, when left without any other guidance except the rails. And the nearer the wheels are to each other in each truck, the more danger there is in allowing the trucks absolute freedom of swiveling. The further apart they are, the less danger. But it is the common way of building trucks to place much of the weight of the body upon side bearings; and this has great effect in depriving trucks of their power of swiveling with the greatest freedom. But this control of the trucks is of great benefit in steadying the truck, and in keeping it from unnecessary friction on the rails.

To the further cross-interrogatories on the part of the Plaintiff, this witness answers as follows :

To the first cross-interrogatory, the witness saith :

1 X. By the theory of the Plaintiff, I mean those peculiarities of his notions expressed in his specification, in conformity to which he recommends a variation from the ordinary way of annexing the wheels in trucks, and connecting the trucks with the body.

To the second cross-interrogatory, the witness saith :

2 X. Upon some railways the speed was very slow; on some, twelve or fifteen miles per hour. These roads were used prior to that time, principally for freight.

To the third cross-interrogatory, the witness saith :

3 X. Prior to 1830, railways were constructed in all the different ways in which they are now constructed. No road was ever, to my knowledge, built of such materials that concentration of weight was required or even allowed, when it could be avoided.

To the fourth cross-interrogatory, the witness saith :

4 X. I cannot say.

To the fifth cross-interrogatory, the witness saith :

5 X. I cannot say.

To the sixth cross-interrogatory, the witness saith :

6 X. I cannot say.

To the seventh cross-interrogatory, he saith :

7 X. As superintendent of the Boston and Maine Railroad, I have designed both passenger and freight railroad cars, and the same on the Erie Road.

CHAS. MINOT.

Subscribed and sworn before me, this November 30, 1853.

JOSEPH F. SABINE, *Com'r, &c.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 30th day of November, A. D. 1853, Charles Minot, of the city, county and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner, by the Circuit Court of the United States within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my rooms in St. Nicholas Hotel, in the city of New York, and was sworn accord-

ing to law, and carefully examined on oath, agreeably to the directions of the said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me before signing, and was then subscribed by said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 17th day of December, A. D. 1853.

JOSEPH F. SABINE, *Com'r.*

### DEPOSITION OF CHARLES B. STUART.

Charles B. Stuart, a witness, being duly sworn, to the direct interrogatories on the part of the Respondents, answers as follows:

To the first interrogatory, the witness saith:

1. My name is Charles B. Stuart; age, 39 years; place of business and residence, New York; profession and occupation, civil engineer.

To the second interrogatory, the witness saith:

2. I was engineer in chief of the United States Navy, under the administrations of Presidents Fillmore and Pierce. I have been State Engineer and Surveyor for the State of New York; have been Chief Engineer of the United States Dry Dock at the Brooklyn Navy Yard, and civil engineer of the said Navy Yard; and have been connected with railroads for twenty years—seventeen years of which time I was constantly engaged on them. I have been connected as engineer, with the Saratoga and Schenectady Railroad, Saratoga and Whitehall, Utica and Schenectady, Syracuse and Utica, Oswego and Syracuse, Tonawanda, New York and Erie, Niagara Falls and Rochester, and the Great Western Railroad from Niagara Falls to Detroit. I am now Engineer in Chief of the Surveys for the Niagara Falls Ship Canal, and Consulting Engineer of the Long Island Water Works Company.

To the third interrogatory, the witness saith:

3. I am perfectly familiar with the eight-wheel cars now in common use.

To the fourth interrogatory, the witness saith:

4. I have examined a copy of Winans's specification.

To the fifth interrogatory, the witness saith:

5. I have examined model B, shown me by the Commissioner, and consider it a true representation of the car described and recommended in said specification.

To the sixth interrogatory, the witness saith:

6. The essential features of construction, and organization, and arrangement of the eight-wheel car are: Two swiveling trucks under one body, sufficiently long to allow the trucks to swivel freely without coming in contact with each other. They should be placed under or near the ends of the body. Each truck should have four wheels, held firm in rigid wheel-frames, securely braced to keep them square, and the axles parallel. The wheels in each truck should be placed so that the bearing points would be distant apart about the width of the track. The middle or centre of each truck must have a king-bolt connection with the body, and the body must be supported, in addition to the centre sup-



port around the king-bolt, by side bearings, to prevent the body from rocking or oscillating when in motion, and to steady the motion of the truck.

To the seventh interrogatory, the witness saith :

7. They have a variety, and all more or less important, in making what is now considered a complete car. Some of them are : rigid wheel-frames, swinging bolsters, transom plates for the body to rest on, pedestals and springs, safety beams, a variety of brakes, draw spring couplings, solid wheels, swinging backs to seats, ventilators, &c. &c.

To the eighth interrogatory, the witness saith :

8. They are. The trucks should be placed from five to seven feet from the ends of the body.

To the ninth interrogatory, the witness saith :

9. They do to keep the body from oscillating and the trucks more steady when in motion.

To the tenth interrogatory, the witness saith :

10. They are, to hold the body from swaying one side and then the other, too much, and to prevent the trucks from turning round when the cars are thrown from the track.

To the eleventh interrogatory, the witness saith :

11. It does not. It is a change of proportions only, and does not introduce any new or different mechanical principles into the organization of the car.

To the twelfth interrogatory, the witness saith :

12. I do not think it practicable, nor do I believe that a truck so constructed would answer to run on a railroad. It would be too flexible, and the spreading and contracting of the wheels by the heavy shocks and wrenches to which the trucks are constantly subjected, would throw the axles out of parallelism, and incline the wheels to climb the rail, either one side or the other. All experience has confirmed the necessity of rigid wheel-frames, to hold the wheels square and the axles parallel.

To the thirteenth interrogatory, the witness saith :

13. I have examined said drawing. It does not show a car constructed with running gear, in the manner particularly described and recommended in said specification. It has rigid wheel-frames of wood. The wheels are not connected by a long spring. It has pedestals and springs, two on each side. The wheels are not as near together as they might be without the flanges touching. The drawings represent a conical pivot X, with sockets and side bearings, forming a solid bolster in one solid piece, with a lower bolster and pocket Y, to correspond, while the specification describes a plain bolster of wood or iron, reaching across, from spring to spring, united to an upper bolster by a king-bolt, swiveling in the manner of the front bolster of a common road wagon. The drawing shows a mode of coupling or drawing the car, by two pieces bolted across the bottom framing, and a coupling bolt with a ring to it, to drop through the coupling, to draw the car from the middle of the end of the body ; the specification neither describes nor intimates any mode whatever by which the cars are to be drawn. The drawing shows cast iron pockets for the ends of the springs to work in ; the specification prescribes a different mode of fastening the ends of the springs, viz : bolting the ends of them on to the boxes of

the axles. The drawing shows an arrangement of brakes suited to the swiveling trucks of the eight-wheel car; the specification does not describe or mention any mode of arranging or using brakes.

To the fourteenth interrogatory, the witness saith :

14. I have.

To the fifteenth interrogatory, the witness saith :

15. It represents an eight-wheel car particularly described in the specification. The drawing shows a four-wheel truck with rigid frames, centre pivot, and side bearings, and a two-wheel truck; but the specification describes the mode of change to make an eight-wheel car, such as is shown in model K.

To the sixteenth interrogatory, the witness saith :

16. I think he would, without the necessity of exercising his own inventive faculties.

To the seventeenth interrogatory, the witness saith :

17. It has, as described in my answer to the fifteenth question.

To the eighteenth interrogatory, the witness saith :

18. I find them precisely as far apart as the width of the track.

To the nineteenth interrogatory, the witness saith :

19. It may.

To the twentieth interrogatory, the witness saith :

20. I have examined said treatise, and find both drawing and description of an eight-wheel double-truck railroad car.

To the twenty-first interrogatory, the witness saith :

21. The car appears to be about double the length of the ordinary four-wheel car. It has two swiveling trucks, one under each end or near the end of the body; rigid stout wheel-frames, which hold the axles parallel, and the bearing points of the wheels are distant apart about the width of the track. The body rests on the centre of each of the truck-frames, and is connected by a pin or bolt, which allows the trucks to swivel and accommodate themselves to all the curves and irregularities of the road. The body rests near the pin or bolt, in the middle of the bolster.

To the twenty-second interrogatory, the witness saith :

22. I have examined model A, and think it truly represents the eight-wheel car represented and described by Tredgold. I have also examined model C. It does not represent the car shown or described. It has no swiveling motion to enable it to turn on its axis, to accommodate itself to the inequalities of the road. It does not divide the pressure among the wheels. No engineer would get up such a car to run on a railroad.

To the twenty-third interrogatory, the witness saith :

23. It contains the substantial combinations possessed by the cars now in general use. It has rigid wheel-frames, the bearing points of the wheels about as far apart as the width of the track, and the trucks are connected with the body by an axis or centre, upon which the trucks turn to meet all the inequalities of a railroad. It differs from the cars now in general use in not having side bearings, and but a small place round the king-bolt for the body to rest on.

To the twenty-fourth interrogatory, the witness saith :

24. I should think it was, most fully.

To the twenty-fifth interrogatory, the witness saith :

25. I have examined said copy, and find in the drawings shown the peculiarities claimed in Winans's specification, with the exception that Fairlamb has a rigid wheel-frame. The wheels are close together. It has also more centre bearing than Winans describes; but the trucks in both are connected with the body at or near the ends, and both are swiveling trucks.

To the twenty-sixth interrogatory, the witness saith:

26. I think the drawing of Fairlamb would be a better guide to a mechanic in constructing cars, such as are now in general use, than Winans's specification.

To the twenty-seventh interrogatory, the witness saith:

27. I have examined the drawings marked G and H, showing a steam carriage invented by Mr. Horatio Allen. The boiler and machinery for operating the steam part of the machine, is borne by two trucks, each made in a rigid and substantial manner, and the axles are held parallel. The bearing points of the wheels in each truck are about as far apart as the width of the track. These two trucks are placed under or near each end of the carriage, sufficiently remote from each other to prevent their coming in contact when swivelling, or turning to the curves of the road. The truck-frame is united to the axes of the wheels, by springs and pedestals, like those now in general use, which gives ease of motion to the body, and prevents the axes from losing their parallelism. The two truck-wheels in each truck were not of the same size, but this made no difference with the action of the car. Each truck had a bolster running across the centre of it, from side to side, and this bolster was connected with another, on which the carriage rested, by means of a swivelling pin, or king-bolt, and the trucks swiveling readily and freely to the curves and other inequalities of the road. There are side bearings on each truck, to support and keep the body from rocking, and steady the trucks. The steam apparatus might be taken off, and a body substituted for the transportation of passengers, without invention; and then it would combine all the mechanical elements of the eight-wheel passenger cars now in general use. It would move smoothly round curves, and steadily and safely over inequalities of the road. It is a much more perfect car than the one patented by Winans, and it would accomplish, in an eminent degree, all the advantages set forth in Winans's specification.

To the twenty-eighth interrogatory, the witness saith:

28. I have examined said model, marked G. Bryant. It consists of two very substantially built trucks, one placed under each end of a frame, sufficiently far apart to allow them to swivel freely without interfering with each other. The wheels are held rigid and the axles parallel, and the bearing points of the wheels in each truck are as wide apart as the gauge of the track. Each truck has bolster pieces in the centre, with a king-bolt passing through it, and each has side bearings. There is also a corresponding bolster attached to the frame, with side bearings, and a king-bolt also passing through it; these bolsters being organized and working one above the other. Its operation is like the eight-wheel cars now in general use, and it is well calculated to run smoothly and evenly, conform to the curves and other inequalities of a road, and do all that Winans claimed for his invention.

To the twenty-ninth interrogatory, the witness saith:

29. The Quincy car has not the peculiarity of the wheels in each truck being coupled by a long spring; the wheels are not as near together as they can be without the flanges touching, nor will it operate like a single wheel; nor does the whole weight of the body rest on the centre of the bolster. These errors Bryant avoided in his car. It combines, however, all the swiveling motion and other requisites for a practical and safe car.

To the thirtieth interrogatory, the witness saith :

30. I think he would.

To the thirty-first interrogatory, the witness saith :

31. I have; and find the mode of drawing cars to be from the end of the body.

To the thirty-second interrogatory, the witness saith :

32. I find in some of the trucks, that the bearing points of the wheels are about as far apart as the width of the track; which is the standard distance in the trucks now in general use.

To the thirty-third interrogatory, the witness saith :

33. Pedestals and springs, as now used, are clearly shown in said edition of Wood, and in the drawings of Allen's carriage.

To the thirty-fourth interrogatory, the witness saith :

34. I think it was.

To the thirty-fourth [?] interrogatory, the witness saith :

35. I think it would not.

To the thirty-sixth interrogatory, the witness saith :

36. It is not. It may be varied by a change in the size of the wheels.

To the thirty-seventh interrogatory, the witness saith :

37. It is essential that the bearing points of the wheels upon the rails should be a proper distance apart. The truck runs much steadier, and has less of a wobbling motion, than when they are as close together as to act like a single wheel. Experience has demonstrated that they should be as far apart as the gauge of the track. They distribute the weight upon the rail much better, are less liable to leave the track in passing over elevations and depressions at high rates of speed.

To the thirty-eighth interrogatory, the witness saith :

38. It is. The trucks are subjected to severe wrenching on a road; and it is essential that the axles be held firm, to keep them square, and to prevent the wheels from climbing the rails, when the trucks are out of square.

To the thirty-ninth interrogatory, the witness saith :

39. I do not now think of any thing.

To the fortieth interrogatory, the witness saith :

40. Winans's theory seems to have been, placing the wheels so close together in each truck, as to make them act like a single wheel, and fastening the wheels, or coupling them together by a long spring, so as to give flexibility to the truck, and resting the body on a bolster, like that of a common waggon; and the coupling of the trucks, one at each end of the body, so that it might hang down between the trucks, or near the end of the body. This was his theory; and this peculiar construction is what he has recommended in his patent.



To the cross-interrogatories on the part of the Plaintiff, the witness answers as follows:

To the first cross-interrogatory, he saith:

1 X. I have stated this in the answer to the second direct question.

To the second cross-interrogatory, he saith:

2 X. I have, for the period stated in my answer to the second direct interrogatory, as an engineer of railroads.

To the third cross-interrogatory, he saith:

3. I have, in several cases of patents.

To the fourth cross-interrogatory, he saith:

4. I have, to a considerable extent, in regard to various kinds of machinery, growing out of claims to patent rights, particularly while Engineer in Chief of the United States Navy.

To the fifth cross-interrogatory, he saith:

5. It has been my duty, as engineer, to make drawings and plans of railroad cars and machines.

To the sixth cross-interrogatory, he saith:

6. I think I am.

To the seventh cross-interrogatory, he saith:

7. It is essential that cars should move round curves with as little friction as possible, all things considered; but it will not answer to sacrifice more important features to this. For instance, if a road was comparatively straight, or had curves of a large radii, it would be better to look to other considerations than the mere passing of curves in the construction of the truck.

To the eighth cross-interrogatory, he saith:

8. It will.

To the ninth cross-interrogatory, he saith:

9. I think not. I think when the bearing points of the wheels in a truck are as far apart as the width of the track, it will pass curves, such as are on the roads in this country, as easily and with as little friction as when the wheels are placed nearer together, or as near as they can be without the flanges touching.

To the tenth cross-interrogatory, he saith:

10. It will not. Too much freedom of the trucks increases the friction of the flanges upon the rails. Unless there is something to steady the truck it oscillates too much.

To the eleventh cross-interrogatory, he saith:

11. I am conversant with the state of railroad engineering prior to the date of Winans's patent, and think I can compare it with the present advanced state of engineering. It is a singular fact, that the essential and substantial requisites for the construction of cars, both four and eight-wheel, were as well understood prior to Winans's patent, as they are now. Winans undertook to make a change, but he did not succeed; and the substantial principles and combinations shown in Chapman, Tredgold, Bryant, Allen, and Jervis cars, are in general use at this day, while Winans's theory is among the past. I have been engaged for the last two years in collecting the early history and progress of railways in Europe and this country, with a view of publishing a work on that subject.

To the twelfth cross-interrogatory, he saith:

12 X. It is not. The four-wheel car is run at as high rates of speed

in England as the eight-wheel cars are here; and it is a matter of notoriety, that the English cars run as smoothly, steadily, and safely as our eight-wheel cars do. Supporting a body from forty to fifty feet long, slightly built at the ends of the body, gives a good deal of spring in the centre of the body, and makes the car ride easy, if the spring is not too great, so as to make too much motion.

To the thirteenth cross-interrogatory, he saith :

13 *X.* It is, if it is intended to run in a train with others.

To the fourteenth cross-interrogatory, he saith :

14 *X.* It is not. The hind truck of the last car in a train has too much freedom of motion, and the car does not ride as pleasantly as those forward of it, as a general thing.

To the fifteenth cross-interrogatory, he saith :

15 *X.* It is not.

To the sixteenth cross-interrogatory, he saith :

16 *X.* The bearing surface in the drawing, I think, is a little broader than shown in the model : but I think the model shows full as much as described in the specification.

To the seventeenth cross-interrogatory, he saith :

17 *X.* The model shows no mode of draft, and none is mentioned in any way in the specification of Winans.

To the eighteenth cross-interrogatory, he saith :

18 *X.* It is. He recommends a long spring, which he particularly describes, to connect the wheels and make the spring answer for the frame.

To the nineteenth cross-interrogatory, he saith :

19 *X.* I consider them essential in all passenger and freight cars, running at high velocities.

To the twentieth cross-interrogatory, he saith :

20 *X.* It does, as may be seen by the following extract taken from Chapman's specification. "Fig. VIII shows a carriage of six-wheels for the engine, which may rest equably or nearly so, on each of its wheels, and move freely round the curves, or past the angles of a railway. 1, 1, the fore pair of wheels are, as usual on railways, fixed to the body of the carriage; 2, 2, and 3, 3, the other two pair, are fixed on axes parallel to each other, to a separate frame, over which the body of the carriage should be so poised as that two thirds of its weight should be over the central point of the four wheels, where the pivot 4, is placed, and the remaining third over the axis 1, 1. The two thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates *c, c*, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves, or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal waggon. And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equably on both) and then similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of a railway." The draft was applied to the body; no other mode being shown.

To the twenty-first cross-interrogatory, he saith :

X 21. There is not ; but on another plate, in the same work, the mode of drawing from the end of the body is clearly shown.

To the twenty-second cross-interrogatory, he saith :

22 X. There is. I give the language of Tredgold : " When a carriage has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels. In the case where eight-wheels are applied to sustain one body, if the body rests upon the wheel frame of each set of four-wheels, in the middle of its length (see Fig. 26, plate IV.) and is connected with those frames, so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure." " Page 179, plate IV, Fig. 26. A diagram to show how a waggon may be made with eight-wheels, so that the stress of each wheel on the rails of a railroad may be equal. The body of the waggon rests on the wheel frames at A, A, and is connected to them by an axis, on which the frames turn, when, from any inequality, the axes of the wheels are not in the same plane. See page 94." If a car is to conform to the greatest possible change of level, it is clear that the truck must swivel, so that the frames will turn, when from any inequalities the axes of the wheels are not in the same plane.

To the twenty-third cross-interrogatory, he saith :

23. Allen's carriage and Winans's invention, vary materially in some parts of their construction ; but both are intended to accomplish the same object. One will do it ; the other will not. Both are swiveling trucks ; both are connected to the body, remotely from each other. Allen's car is constructed in the same manner as cars now in general use.

" The object of Winans's invention is, among other things, to make such an adjustment of the wheels and axles, as shall cause the body of the car or carriage to pursue a more smooth, even, direct and safe course than it does as cars are ordinarily constructed, both over the curved and straight parts of the road, by the before mentioned desideratum of combining the advantages of the near and distant coupling of the axles."

To the twenty-fourth cross-interrogatory, he saith :

24 X. The answer to this question is given in my last preceding answer.

To the twenty-fifth cross-interrogatory, he saith :

25 X. I think he would. The requirements then were the same as now. With Allen's, Bryant's, Jervis's and Chapman's car before him, he could not fail to see the whole essential principles fully developed.

To the twenty-sixth cross-interrogatory, he saith :

26 X. I do.

To the twenty-seventh cross-interrogatory, he saith :

27 X. To the truck, I understand.

To the twenty-eighth cross-interrogatory, he saith :

28 X. It is not a matter of indifference. Both methods have their advantages, dependent on a variety of local circumstances.

To the twenty-ninth cross-interrogatory, he saith :

29 X. They are.

To the thirtieth cross-interrogatory, he saith :

30. X. It is not, as is shown in Chapman's drawings.

To the thirty-first cross-interrogatory, he saith :

31. X. They would not.

To the thirty-second cross-interrogatory, he saith :

32. X. Great length of body is not the essential requisite to stability of motion ; there being a practical limit in the length of car bodies, beyond which or under which it will not answer to go.

To the thirty-third cross-interrogatory, he saith :

33. X. It would not. I believe I have before said the greatest possible freedom to the trucks is not desirable or safe.

To the thirty-fourth cross-interrogatory, he saith :

34. X. The arrangement and organization of the eight-wheel cars, that have been described as inventions prior to Winans's, were of such a character as to perform with safety all that Winans claims. Jervis, in his description of his six-wheel engine, published in the Railroad Journal, in 1833, shows that his arrangement and organization was intended to give ease of motion to the carriage, at high rates of speed, and the same is true of all the prior inventions which operated upon the same mechanical principles.

To the thirty-fifth cross-interrogatory, he saith :

35. X. That was one of the purposes of the eight-wheel cars, but it was not the exclusive one. All of these cars did accomplish that, and were well adapted to accomplish others, and to run evenly and smoothly.

To the thirty-sixth cross-interrogatory, he saith :

36. X. I cannot say for what precise purpose they were employed. The loads carried on some of them could have been subdivided, I should think.

To the thirty-seventh cross-interrogatory, he saith .

37. X. I have not.

To the thirty-eighth cross-interrogatory, he saith :

38. X. I am not.

To the thirty-ninth cross-interrogatory, he saith :

39. X. I have not.

To the fortieth cross-interrogatory, he saith :

40. X. I have not so stated.

To the forty-first cross-interrogatory, he saith :

41. X. I have not.

In answer to the further direct interrogatories on the part of the Respondents, the witness saith :

To the first interrogatory, he saith :

1. I never knew that he had a patent for an eight-wheel car until about the time of the suit against the Schenectady and Troy Railroad. I never knew of his making any claim until then.

To the second interrogatory, he saith :

2. It would not.

To the third interrogatory, he saith :

3. It would not, most certainly.

To the fourth interrogatory, he saith :

4. There is not.

To the fifth interrogatory, he saith :

5. There is not.



To the sixth interrogatory, he saith :

6. There is not.

To the seventh interrogatory, he saith :

7. I answer that it would not, to both branches of the question.

To the eighth interrogatory, he saith :

8. I consider there is an essential difference between the theory of Winans and that on which the eight-wheel cars now in use are constructed. I have described the difference in my previous answers.

To the ninth interrogatory, he saith :

9. It is not.

To the tenth interrogatory, he saith :

10. I have stated, in my former answers, that they should not have the greatest possible freedom to go forward in the line of the radius of the curve. They have more freedom, and would oscillate much more when the wheels in each truck are close together than when separated as far apart as the width of the track.

To the cross-interrogatories in addition, on the part of the Plaintiff, this witness answers as follows :

To the first cross-interrogatory, he saith :

1 X. I consider his theory to be coupling the wheels by a long spring, bringing the wheels so close together as to act as near like a single pair of wheels as possible; and, resting the ends of the body on a bolster, like that to the common road waggon bearing, giving but a small central bearing on each side of the king-bolt.

To the second cross-interrogatory, he saith :

2 X. There was no established rate. They were used for carrying freight and passengers.

To the third cross-interrogatory, he saith :

3 X. They were, and are so now.

To the fourth cross-interrogatory, he saith :

4 X. Two : Stockton and Darlington, and Liverpool and Manchester.

To the fifth cross-interrogatory, he saith :

5 X. Horse power was used, and so was steam; and passengers transported as well as freight.

To the sixth cross-interrogatory, he saith :

6 X. I have answered this in my answer to the fourth cross-interrogatory.

To the seventh cross-interrogatory, he saith :

7 X. I have designed railroad cars, as stated in a previous answer.

CHARLES B. STUART.

Subscribed and sworn before me, this December 3d, 1853.

JOS. F. SABINE, *Comr.*, &c.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 2d and 3d days of December, A. D. 1853, Charles B. Stuart, of the City, County, and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States, within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my rooms

in St. Nicholas Hotel, in the city of New York, and was sworn according to law, and carefully examined on oath agreeably to the directions of said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 17th day of December, A. D. 1853.

JOS. F. SABINE, *Commissioner*.

### DEPOSITION OF WALTER McQUEEN.

Walter McQueen, a witness produced and duly sworn on the part of the Respondents, in answer to the direct interrogatories, saith :

To the first interrogatory, the witness saith :

1. My name is Walter McQueen ; age 35 years ; place of business and residence, Schenectady ; profession, mechanical engineer ; occupation, Superintendent and Master Machinist of the Schenectady Locomotive Works.

To the second interrogatory, the witness saith :

2. I have been engaged in the construction of railroad machinery, cars and locomotives, for about fourteen years. I designed the express locomotives used on the Hudson River Railroad, that run at from forty to sixty miles per hour. I have designed many other locomotives, now in use on several roads in the United States. I had charge of the machinery on the Hudson River Railroad, prior to going to Schenectady. Prior to that, I had charge of the machinery on the Albany and Schenectady Railroad, for several years. In addition to my practical knowledge, I have read all the standard works on railroad machinery.

To the third interrogatory, the witness saith :

3. I think I am.

To the fourth interrogatory, the witness saith :

4. I have examined the specification of Ross Winans's patent, of October 1, 1834, and understand it. It does not set forth any fixed principle, nor any specific mode of construction and organization, from which a car can be constructed to run with safety or practical utility on a railroad. It describes the wheels as close together as they can be placed, without stating what diameter of wheels are to be used, and without giving any idea of the proper distance of the bearing points of the wheels apart. It does not describe any mode, nor intimate any means or necessity, of keeping the axles parallel, nor the wheels square on the track. It describes a spring coupling the wheels, which is wholly impracticable, will not keep the axles parallel, nor the wheels square. I do not consider it safe to run upon a railroad. No such car, to my knowledge, is in use upon any of the railroads of the United States.

To the fifth interrogatory, the witness saith :

5. I have examined model B, now shown me. It is a correct representation of the car described and recommended by the specification.

To the sixth interrogatory, the witness saith :

6. They should have rigid truck-frames, holding the axles of the wheels parallel, and the bearing points of the wheels should be about as far apart as the width of the track; and if the line of the road is considerably straight, they may be a trifle wider apart. Two trucks placed under each end of a body of suitable length, so adjusted, as to distance apart, as to support, in the best manner, the weight to be carried in the car. Each end should rest on bolsters and side bearings, with a king-bolt passing through the centre of the bolster, so as to allow the trucks to swivel freely, to conform to the curves and inequalities of a railroad. These requisites are elemental and essential. Cars constructed in this way will run smoothly and safely.

To the seventh interrogatory, the witness saith:

7. They do, a large number; side bearings, pedestals, with springs, brakes, draw springs, swinging bolsters, safety beams, many kinds of boxes and springs, &c. &c.. None of these are mentioned in Winans's specification. There are many others that might be mentioned.

To the eighth interrogatory, the witness saith:

8. They are. The distance is from five to seven feet.

To the ninth interrogatory, the witness saith:

9. They do; and to steady the cars.

To the tenth interrogatory, the witness saith:

10. They are used, more or less, to prevent the trucks from turning round when thrown from the track, and to prevent the body from being tipped over too far on either side.

To the eleventh interrogatory, the witness saith:

11. It does not, unless you go to extremes. Changes of this kind would not introduce any new mechanical principles, nor would it require invention to make them.

To the twelfth interrogatory, the witness saith:

12. A car would not, in my judgment, be practicable or safe with the axles of the wheels coupled together by a spring, as described and recommended by Winans. The axles would not maintain their parallelism, and the trucks would be so much wrenched out of square as to strongly incline them to crowd the rail with the flanges of the wheels, and throw them off the track. My experience has fully convinced me of the necessity of a rigid truck frame, without which a car is not safe. The wrenches upon the trucks, with a high rate of speed, are very severe, and they must be constructed strong enough to withstand them without being thrown out of square. It would not be practicable to keep the leaves of springs connected, as recommended by Winans, from spreading out like a fan, by limited use.

To the thirteenth interrogatory, the witness saith:

13. It does not. It differs essentially. The frames of the trucks are rigid in the drawing; they are of wood also. The wheels in each truck are not as close together as they might be without the flanges touching. The wheels are not coupled by a long spring. Two springs on each side, with pedestals, are shown in the drawing.

To the fourteenth interrogatory, the witness saith:

14. I have been shown by the Commissioner, what is said to be a true copy of the drawings and specification of W. & E. W. Chapman, printed in London, in 1814. The copy shown is attached to the com-

mission. I have seen and examined the book also, more than a year since.

To the fifteenth interrogatory, the witness saith :

15. The whole of the essential construction and organization of the eight-wheel car, as now used by the railroads generally, is contained in the specification and drawing of the six and eight-wheel carriages of William & Edward Chapman, printed and published in the 24th volume, second series, of the Repertory of Arts, in the year 1814, in London. The drawing Fig. VIII of the specification, shows a transom or wheel-frame with its four wheels having the centres of the wheels or their bearing points on the rails, a distance apart equal to the breadth of the track; and the specification distinctly states that two of them, both alike, should be used for an eight-wheel carriage, and one of them with a pair of wheels for a six-wheel carriage. They are used both ways on railroads in this country, and the model K is a correct representation of the carriage described in Chapman's specification, in the Repertory of Arts. All the essential principles of the distance of the bearing points of the wheels apart, and of constructing the rigid rectangular wheel-frame to hold the wheels square and the axles parallel, with the centre pivot; and the organization of these two under one body, to turn the curves, and pursue a smooth, even and safe course, the same as used on railroads, are described and shown in Chapman's specification and in the model K, which corresponds with it. Putting larger wheels on the same axles, in place of the smaller ones, would bring the faces of the wheels close together, but would not alter the principles; the essential proportion and construction would remain the same, whether horses or men are put in it to propel themselves, as stated by Chapman, or are in it as freight or passengers. Being drawn by a steam engine attached to it, makes no difference in the principle of the car.

To the sixteenth interrogatory, the witness saith :

16. He certainly would.

To the seventeenth interrogatory, the witness saith :

17. It has side bearings, centre pivot, and rigid wheel-frames, as described in my previous answers.

To the eighteenth interrogatory, the witness saith :

18. They are, according to measurement.

To the nineteenth interrogatory, the witness saith :

19. It could be, by taking away one of the trucks, and substituting a pair of wheels. I have constructed six-wheel cars or tenders myself, which are now running on railroads, containing all the essential mechanical principles that are combined in the six-wheel car of Chapman.

To the twentieth interrogatory, the witness saith :

20. I have. The same arrangement and principle of the eight-wheel car, as now used for conveying freight and passengers, is contained and given in the printed publication, Tredgold's Practical Treatise on Railroads and Carriages, pages 94 and 179, and Fig. 26, Plate IV, printed and published in London, in 1825. It has the usual four-wheel rectangular frames, with cross pieces, secured by joint-bolts, and the vertical axis to each frame, as well known before, and described by Chapman. The bearing points of the wheels also, are about as wide apart as the



gauge of the track,—to run safely on curves and the straight track, and turn, where, from any inequality, the axis of the wheels are not in the same plane; which is the case on curves, and at inequalities at the joints of the rails. It also divides the pressure equally among the wheels, and conforms to the changes of level, as described and required by Tredgold. The description and drawing are so clear in mechanics, that I think any ordinary car builder or mechanic could make the eight-wheel cars now used on railroads, in all their essential details and arrangement and principles of construction, to turn the curves, and at the inequalities which throw the axis out of plane, conform to the changes of level, divide the pressure, and preserve a smooth, even and direct course, with safety, without any other aid or assistance whatever.

To the twenty-first interrogatory, the witness saith :

21. I have described said car in my last answer.

To the twenty-second interrogatory, the witness saith :

22. I have; and find it a correct representation of the Tredgold car, as represented and described in his book. The model C is not. It neither conforms to Tredgold's description, nor his drawing, and will not divide the pressure equally among the wheels, nor conform to the changes of level of a curve, nor turn from contact with inequalities. It has a cross axletree, and none is described or required by Tredgold. It has not the wheel-frame nor axis, nor the bearing point of the body, which Tredgold calls for; it is worthless, and no mechanic would make such a thing from Tredgold's description, nor with the intention of running it on a railroad.

To the twenty-third interrogatory, the witness saith :

23. The Tredgold car contains substantially the mechanical principles and mode of operation of the eight-wheel cars used throughout the country.

To the twenty-fourth interrogatory, the witness saith :

24. It is, most fully.

To the twenty-fifth interrogatory, the witness saith :

25. I have. Four-wheel trucks, connected with a body near each end, by means of a king-bolt, with centre bearings. The trucks capable of swiveling and conforming to the curves and inequalities of roads. There is more centre bearings shown in Fairlamb's drawing than described in Winans's specification. The wheels, also, are further apart in each truck. The two trucks are remote from each other.

To the twenty-sixth interrogatory, the witness saith :

26. I think he would.

To the twenty-seventh interrogatory, the witness saith :

27. The same arrangement and principle of construction and operation as contained in the eight-wheel car, is also contained in the steam carriage, delineated by the drawings G and H. They have the long body secured to and borne upon bolsters or cross-pieces, connected by centre pivots to two rigid rectangular wheel-frames, having each four wheels, with the axis parallel, and pedestals with springs and side bearings; the bearing points of the wheels on the rails are square, or equal to the breadth of the track, as shown by measurement of the general plans in both drawings. The arrangement, combination and principle is identically the same as the eight-wheel cars or carriages

now in use, in all the essential details and organization; and that steam carriage or box, placed on the same bolsters, to contain freight or passengers, would move past the curves and angles of the railway with the same facility and safety, and pursue a smooth, even and direct course on the road, the same as the eight-wheel cars now in general use.

To the twenty-eighth interrogatory, the witness saith:

28. I have. It has two four-wheel trucks, rigid square wooden frames and bolsters, or cross-pieces, extending both from side to side, and from back to front; and resting on the top of these two four-wheel trucks is a strong framing or body, having two bolsters, one across each of its ends; and through the bolsters and the centres of the trucks are centre pivots or vertical king-bolts, by which means the body-framing coupled the trucks, sufficiently far apart to allow them to swivel freely to the curves of the road. The distance between the bearing points of the wheels in each truck, or from centre to centre of the wheels, is five feet, the same as the breadth or gauge of the track; and the distance between the king-bolts of the body that connected it with the trucks is about ten feet, I should judge, by the scale of the model. Its mechanical principles of operation are like the cars in general use. By removing the frame, and substituting a body of fifty feet in length, which could be done without invention, and putting the Allen springs under the body, or such as are represented in the drawing in Wood's treatise; and it would perform as well, and run as smoothly as the cars now in general use.

To the twenty-ninth interrogatory, the witness saith:

29. All that is essential in the arrangement of two swivelling trucks under one body, and their connection with it at each end, the trucks being placed as far apart as the length of the body will permit, is contained in the Bryant car. It avoids all the prominent defects of Winans's, in having the wheels so close together as only to prevent their flanges from touching, they being apart at least five feet, from centre to centre. It has rigid wheel-frames, to hold the axles parallel, instead of their being coupled by a long spring.

To the thirtieth interrogatory, the witness saith:

30. He would, most certainly. I could, I am confident.

To the thirty-first interrogatory, the witness saith:

31. I have examined said works, and find that cars were drawn by a coupling, from the end of the bodies, prior to 1830.

To the thirty-second interrogatory, the witness saith:

32. The distance of the wheels apart is about, from bearing point to bearing point, the same as the width of the track, being the distance adopted in the trucks of cars generally throughout the United States.

To the thirty-third interrogatory, the witness saith:

33. They were.

To the thirty-fourth interrogatory, the witness saith:

34. It was.

To the thirty-fifth interrogatory, the witness saith:

35. I answer all these questions in the negative. No invention would be required to make the changes suggested in the questions.

To the thirty-sixth interrogatory, the witness saith:

36. The distance of the flanges is not material, but the distance of the bearing points is.

To the thirty-seventh interrogatory, the witness saith :

37. Certainly ; for these are the points of contact between the car and the rails.

To the thirty-eighth interrogatory, the witness saith :

38. It is ; and a car would not be safe to run on a road if the axles were not held rigid in the truck, equidistant from each other. When cars are brought to the shop for repair, if the flanges are worn by the rail, as they frequently are, I find the trucks have been wrenched out of square. Car builders find it necessary to brace their trucks very strongly, to keep them square. The increased friction between the flange of the wheels and the rails, produced by a flexible or yielding truck, makes unsteadiness of motion in the car body as well as the truck, and renders it disagreeable and dangerous to passengers.

To the thirty-ninth interrogatory, the witness saith :

39. I cannot say that I do.

To the fortieth interrogatory, the witness saith :

40. I consider the theory of Winans to be, bringing the flanges of the wheels close together, without regard to their size. If the wheels were very small, and the flanges as close together as they could be without touching, they would act as Winans described they should—like a single wheel. This he supposed would cause the axles to coincide more nearly with the radii of the curves of the track, and allow the truck to pass round the curves easier than it would if the bearing points of the wheels were further apart. The peculiar construction of the flexible truck, or long spring connection of the axis, and the resting a body on a small surface near the king-bolt, and the distant coupling of the trucks from each other, are what appears to be his theory ; and it is all fallacious, with one exception—the distant coupling of the trucks from each other. I do not know of a single car, now in use, that embodies Winans's theory. His theory and the practice of the last twenty years, do not go hand in hand. The theory which he introduced only made cars more unsafe than they were before, and had to be abandoned. The benefits which he claimed for it were only attained by going back to the structures of Chapman, Tredgold, Allen, Bryant, and Jervis ; the principles and operations of which are now embodied in all the cars in the United States.

To the cross-interrogatories on the part of the Plaintiff, this witness answers as follows :

To the first cross-interrogatory, the witness saith :

1 X. I have answered this in the second direct answer.

To the second cross-interrogatory, the witness saith :

2 X. I have, for a period of nearly fourteen years.

To the third cross-interrogatory, the witness saith :

3 X. Yes ; twice ; once in Boston and once in Albany ; both relative [?] the double plate car-wheel.

To the fourth cross-interrogatory, he saith :

4 X. I have, in the examination and comparison of railroad machinery ; and have practised it more or less for several years past.

To the fifth cross-interrogatory, he saith :

5 X. It has been my principal employment to attend to the construction and arrangement of cars and locomotives.



To the sixth cross-interrogatory, he saith :

6 X. I think I understand, theoretically and practically, the principles involved in the construction and operation of railroad cars of various kinds, and the properties essential to their proper operation. Cars properly constructed, will run at any reasonable rate of speed with safety, and they will run evenly and smoothly, and pass the curves and switches, without the flanges of the wheels coming in contact with or rapping against the rails, to an extent to produce serious inconvenience, or to cause severe shocks and concussions to either the trucks or body. The proper construction I have described in my former answers.

To the seventh cross-interrogatory, the witness saith :

7 X. It should; but cars constructed after Mr. Winans's theory would not do so.

To the eighth cross-interrogatory, the witness saith :

8 X. It is.

To the ninth cross-interrogatory, the witness saith :

9 X. It will not. There is a limit in the distance and nearness of the wheels in a truck, which should be observed. With small wheels, and the flanges near together, the truck has too much wobbling, runs unsteady, causing rapid shocks and concussions, injurious to the machinery and road, and unpleasant and even dangerous to passengers. If the tread of the wheels are as far apart as the gauge of the track, or even farther, the truck runs much steadier, and the whole car moves more smoothly and evenly. I consider it essential to the operation of a car, that the wheels should be about as far apart as the gauge of the track. Formerly, in the construction of the forward truck under locomotives, the wheels were brought near together, from necessity, to accommodate and give room to the machinery of the engine; but they moved so unsteady, and shook and injured the machinery and road so much, that it became an object to make a change, and spread the wheels in the truck further apart, so as to distribute the weight over a greater surface of the rails, and make the truck run more steady. In some trucks under locomotives, the bearing was taken from the king-bolt and placed at the sides, near the wheels. This, to some extent, steadied the motion, and restrained the wobbling of the truck, to a considerable degree.

To the tenth cross-interrogatory, he saith :

10 X. They will not. Too much freedom does not lessen, but increases the friction, in passing curves, and on irregularities of the road.

To the eleventh cross-interrogatory, he saith :

11 X. I have read most of the works on railroad engineering, before the date of Winans's patent, and have, in my mind, compared them with the present advanced state. The essential requisites of an eight-wheel swiveling truck were as well known prior to Winans's patent as now. He labored to introduce a new theory, but it was a failure. The Allen car, the Bryant car, and the Chapman car, possessed the substantial and requisite features of a practical eight-wheel swiveling car. Various additions have been made, but the substantial principles were the same then as now.

To the twelfth cross-interrogatory, he saith :

12 X. Four-wheel cars, at high rates of speed, run as steady as the



eight-wheeled cars, when properly coupled together. "Great length" of body in a car is not the essential feature to produce great steadiness of motion. There is a limit to the length of the body, which should be observed in the construction of cars.

To the thirteenth cross-interrogatory, the witness saith :

13 X. It most certainly is.

To the fourteenth cross-interrogatory, he saith :

14 X. It is not. The hind truck of the last car in a train does not run as steadily as the first truck in the forward car. This is well understood by all who have noticed the difference in riding in the different cars in a train.

To the fifteenth cross-interrogatory, he saith :

15 X. It is not. The draft in most of the cars is applied to the truck through the king-bolt, from the body of the car, or through a chain connected with the truck.

To the sixteenth cross-interrogatory, he saith :

16 X. It represents full as much bearing surface as described in the specification, but not quite as much as shown in the drawing.

To the seventeenth cross-interrogatory, he saith :

17 X. Model B shows no mode of attaching the draft, and I cannot find any one mentioned in the specification. On that subject there is no suggestion made or word said.

To the eighteenth cross-interrogatory, he saith :

18 X. There is. A long spring with the long leaf at the bottom and the shorter ones on the top. This spring connected the axles in each truck.

To the nineteenth cross-interrogatory, he saith :

19 X. They are certainly very convenient, if properly made and suitably applied ; but I do not consider such springs as are described by Winans, to be used for the objects set forth by him, to be essential or proper for a car.

To the twentieth cross-interrogatory, he saith :

20 X. It does. The draft, I think, was applied to the body. The following description of the car is given by Chapman himself. This with the plate is sufficient to enable a mechanic to construct a car like those in general use. "Fig. VIII shows a carriage of six-wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels, are as usual on railways, fixed to the body of the carriage ; 2, 2, and 3, 3, the other two pair, are fixed on axles parallel to each other, to a separate frame, over which the body of the carriage should be so poised as that two thirds of its weight should lie over the central point of the four-wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates *c, c*, so as to admit the ledges of the wheels or those of the way, to guide them on its curves or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal waggon. And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equably on both) and

then similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of a railway."

To the twenty-first cross-interrogatory, he saith :

21 X. There is not; but in a drawing in the same work, plate I, fig. 1 and 2, there are trains of four-wheel cars, drawn from the end of the body.

To the twenty-second cross-interrogatory, he saith :

22 X. There is. When a car has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels. "In the case where eight wheels are applied to support one body, if the body rests upon the wheel-frame of each set of four wheels, in the middle of its length (see Fig. 26, Plate IV), and is connected with these frames, so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure." Page 179, Plate IV, Fig. 26: A diagram to show how a waggon may be made with eight wheels, so that the stress of each wheel on the rails of a railroad may be equal. The body of the waggon rests on the wheel-frames at A, A, and is connected to them by an axis, on which the frames turn, when, from any inequality, the axes of the wheels are not in the same plane. See page 94.

To the twenty-third cross-interrogatory, he saith :

23 X. The swiveling part of Winans's trucks are contained in Allen's steam carriage, and the manner of connection with the body, near its ends, is the same; also, the remote coupling the trucks, but nothing further. Allen's carriage was constructed as the cars now in general use are.

To the twenty-fourth cross-interrogatory, he saith :

24 X. The same answer as that last given is applicable to the Quincy car.

To the twenty-fifth cross-interrogatory, he saith :

25 X. I think he would, without doubt. He would have derived his knowledge from the Chapman, Tredgold, Bryant, Allen and Jervis cars and carriages; all of which possessed the requisite and indispensable characteristics to make them "run safely and smoothly" on the curves and inequalities of a railroad, at any given practicable rate of speed.

To the twenty-sixth cross-interrogatory, the witness saith :

26 X. I do.

To the twenty-seventh cross-interrogatory, the witness saith :

27 X. I have understood it was applied to the truck.

To the twenty-seventh (?) cross-interrogatory, the witness saith :

28 X. It is not altogether a matter of indifference. Both modes have their advantages.

To the twenty-ninth cross-interrogatory, the witness saith :

29 X. They were.

To the thirtieth cross-interrogatory, the witness saith :

30 X. It has not. The Chapman car is an instance to the contrary.

To the thirty-first cross-interrogatory, the witness saith :

31 X. They would not; nor would the experience, since the time those cars were originated, so teach a mechanic; for it is not true that placing the wheels of the trucks very near together, does "reduce the friction between the flanges of the wheels and the rails over the curves."

To the thirty-second cross-interrogatory, he saith :

32 X. I doubt very seriously whether "great length of body," of itself, so supported, gives great stability and ease of motion in a car, at any rate of speed.

To the thirty-third cross-interrogatory, he saith :

33 X. The trucks should not have the *greatest possible* freedom to move with the least practicable friction on the rails. The constraint of the draft and side bearings have the effect to steady the truck, and make it less wobbling, less liable to be thrown from the track, and more safe for use.

To the thirty-fourth cross-interrogatory, he saith :

34 X. There is not, except in the Allen carriage; nor was it necessary there should be. The structures themselves showed they would answer such a purpose.

To the thirty-fifth cross-interrogatory, he saith :

35 X. It is not. The language of Mr. Allen and Mr. Bryant shows that their cars were not only intended to distribute the weight over a greater bearing surface upon the rail (a very desirable object then as well as now), but to run smoothly and evenly. Mr. Bryant, in his testimony in the case of *Winans vs. Eaton, Gilbert & Co.*, says, "the objects of its construction were, to carry a large load, on eight wheels, without injury to the road; to turn the curves freely; descend the inclined plane, and run on the road, carrying the stone as smoothly and safely as possible." The Allen carriage was also calculated to do all that the cars of the present day perform—running smoothly and safely. From its combination and mode of construction it could not have failed to accomplish these desirable objects.

To the thirty-sixth cross-interrogatory, the witness saith :

36 X. I have no personal knowledge on the subject.

To the thirty-seventh cross-interrogatory, the witness saith :

37 X. I have not, and am not.

To the thirty-eighth cross-interrogatory, the witness saith :

38 X. I am not connected with any railroad company.

To the thirty-ninth cross-interrogatory, the witness saith :

39 X. I do not know that I have formed any definite opinion on this subject. I think cars constructed in the manner recommended in the specification, would be unsafe to run on a railroad, and I know of none such now in use.

To the fortieth cross-interrogatory, the witness saith :

40 X. I have not so stated.

To the forty-first cross-interrogatory, the witness saith :

41 X. I have not.

To the further direct interrogatories on the part of the Respondent, the witness answers :

To the first further interrogatory, he saith :

1. I never knew that Winans had any patent for his eight-wheel car, until after the suit was commenced against the Schenectady and Troy Railroad—I think in 1847.

To the second further interrogatory, he saith :

2. It would not. The change would be one of proportions. If a body was placed on the Bryant car, instead of the frame now shown,

or a body on the Allen carriage, instead of the boiler and other machinery, it would not affect the mechanical principles of their construction, nor change their mode of operation.

To the third further interrogatory, the witness saith :

3. No invention would be required to make the substitution, in my judgment.

To the fourth further-interrogatory, the witness saith :

4. There is not. Neither the principles nor the operation of the car would be changed by placing the trucks double the distance apart they now are shown to be in the drawing.

To the fifth further interrogatory, the witness saith :

5. I answer this question in the same way.

To the sixth further interrogatory, the witness saith :

6. I answer this also in the same way.

To the seventh further interrogatory, the witness saith :

7. It would not.

To the eighth further interrogatory, the witness saith :

8. There is a difference, and I consider it an essential one, in the arrangement of the wheels. The one recommends them to be as near together as they can be, without regard to the size of the wheel, and those now in general use are as far apart as the gauge of the track, from bearing point to bearing point. Both are connected to the body near each end, by a king-bolt, upon which the body and trucks turn, to conform to the sinuosities and irregularities of a railroad. Winans has the body rest on a small surface or bolster around the king-bolt, while the cars now in general use have side bearings, as well as centre, for the body to rest on ; and these side bearings I believe to be essential for the safer operation of the car.

To the ninth further interrogatory, the witness saith :

9. Winans says the body of the car should be double the usual length of the ordinary four-wheel car body, which would make it less than thirty feet in length. A longer body is not necessary to accomplish the purposes claimed by him.

To the tenth further interrogatory, the witness saith :

10. I have answered this question fully before. They should not have the greatest possible freedom.

In answer to the cross-interrogatories in addition, on the part of the Plaintiff, this witness says as follows :

To the first additional cross-interrogatory, he says :

1 X. I have previously answered what I considered to be Winans's theory.

To the second additional cross-interrogatory, he saith :

2 X. I am unable to say from personal knowledge.

To the third additional cross-interrogatory, he saith :

3 X. They were, and are now.

To the fourth additional cross-interrogatory, he saith :

4 X. I cannot say.

To the fifth additional cross-interrogatory, he saith :

5 X. Locomotives were used prior to that period. Railways transported both persons and freight prior to 1830, I think.

To the sixth additional cross-interrogatory, he saith :



6 X. I cannot say what the average freight was.

To the seventh additional cross-interrogatory, he saith :

7 X. I have, as stated in my answer to the second direct interrogatory.  
WALTER McQUEEN.

Subscribed and sworn before me, this Dec. 2, 1853.

JOS. F. SABINE, *Com'r. &c.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 1st and 2d days of December, A. D. 1853, Walter McQueen, of the city and county of Schenectady, and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States, within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my chamber in St. Nicholas Hotel, in the city of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 15th day of December, A. D. 1853.

JOSEPH F. SABINE, *Com'r.*

DEPOSITION OF JOHN WILKINSON.

John Wilkinson, a witness on the part of the Respondents, being duly sworn, in answer to the direct interrogatories, answers as follows :

To the first interrogatory, the witness saith :

1. My name is John Wilkinson ; my age is fifty-five years ; residence Syracuse. I am a Director in the New York Central Railroad Company.

To the second interrogatory, the witness saith :

2. I have been President of the Syracuse and Utica Railroad nearly sixteen years, and for twelve years was the superintendent of the railroad, having the charge of its whole business, machinery, and operations.

To the third interrogatory, the witness saith :

3. I am.

To the fourth interrogatory, the witness saith :

4. I have examined them, and am familiar with them.

To the fifth interrogatory, the witness saith :

5. I have examined the model marked B. I consider it to be a true representation of the alleged improvement claimed as the invention of Ross Winans. There may be a difference in the area of the part where the upper and lower bolster come in contact, between the specification model and drawing ; the specification requiring the whole weight of the load to be borne upon the centre of the bolster, and also upon the centre of the truck, while in the model no inconsiderable amount of

bearing is represented surrounding the centre of the bolster ; and if any objection is made to the model, it is that it represents too much bearing surface. On the other hand, the drawing represents rather more bearing surface than the model, and one which varies very much from the directions in the specification, both in area and in its extent towards the ends of the bolster. The boxes in which the axles revolve, are represented as inside of the wheels, and correctly, as I think ; since outside bearings, or bearings upon the axles outside of the wheels, was the subject of a separate patent of Mr. Winans, and this mode of building the truck was not directed in the specification, nor would it have been competent to any one to use that mode of construction, by reason of having purchased the right to construct a car according to the patent now in controversy. And furthermore, if outside bearings on the axles had been placed on the model, or on any car, it would have been impossible to bring the wheels into the position required by the patentee ; because, in uniting the two opposite springs, it would have been necessary to insert the lower bolster between the wheels, and they could not then have "been brought as near as might be without their flanges touching." The body of the car is not described in any part of the patent ; and I do not think that material, as the patent relates only to the running gear and its connection with the body. The model is not incorrect in thus representing a mere box, instead of a car body of any description. No mode of draft is represented on the body or by the trucks. In this respect the model conforms to the specification, and differs from the drawing, if it can be said with propriety that a mode of draft is represented upon the drawing, which composes a part of the picture, but which is not referred to by letter or description of any kind ; and is at most merely a contrivance by which a mode of drawing might be added, which is not in fact added ; namely, a bolt with a ring in it. Having carefully examined the patent, drawings, and specification, I consider the model a correct representation of that which is described in the specification.

To the sixth interrogatory, the witness saith :

6. In eight-wheel cars now in common use in this country, there are many parts, and combinations of parts, which go to make up the construction, and to assist them in running smoothly and safely over our railroads. Of these parts, those may be considered essential and elemental, without which eight-wheel cars, such as are in common use, could not be organized. These parts are, a body, and two trucks so connected with it as to be able to swivel under it. The arrangement that is essential and elemental is, that these two trucks shall be placed under the body in such a position as best to support the weight thereof, and so far apart as not to interfere. The arrangement of wheels in each truck must be such that they shall not be so far apart as not to be able easily and freely to pass the sharpest curves and switches of the road, and not so near together as to wobble about, be too unsteady, or bring the weight of the two wheels upon an unsupported part of the rail, make too small a base of support, or produce unnecessary friction on the straight or curved parts of the road. Two trucks, constructed within these limits, in a proper manner, thus connected to the body, and thus united by the body itself, constitute all that essentially distinguishes an eight-wheel from a four-wheel car.

To the seventh interrogatory, the witness saith :

7. Undoubtedly there are numerous improvements and inventions in the common eight-wheel car which were not known in 1834, and some of them are indispensable to the comfort and safety of the traveller by railway. Patent car wheels; lubricating boxes; Babbit metal bearings; patent brakes and safety beams; swinging bolsters; check chains; vulcanized India-rubber springs; pedestals to the wheels; draw spring couplings, are some of the various improvements that occur to me as not being embraced in Winans's description of his improvement in his car.

To the eighth interrogatory, the witness saith :

8. They are so constructed.

To the ninth interrogatory, the witness saith :

9. All cars now have side-bearings; and many if not most cars used for rapid travelling, have all the weight of the load borne upon side-bearings, and none upon the king-bolt or its equivalent. It would be in the highest degree dangerous to attempt to place the bearing of the load at or near the centre of the truck while under high speed.

The reasons for employing side bearings are:—

1. To resist the tendency of the centrifugal force, to capsize the car in passing curves.

2. To furnish a broader basis of support to the body of the car, to prevent its canting to one side or the other on the straight track.

3. To maintain a wholesome restraint upon the freedom of swiveling of the truck, so that slight irregularities in the surface of the rails, may not too easily turn the truck out of its right position.

4. To connect the body of the car with the truck, so that before the springs can yield enough to allow the flange to pass over the track, it will be obliged to overcome the vis inertia of the body itself.

To the tenth interrogatory, the witness saith :

10. They are used to control the truck and prevent the swiveling round too far in case of accident, and to maintain either of the corners of the frame of the truck, in case of a breach of the axle or wheel.

To the eleventh interrogatory, the witness saith :

11. Neither the one nor the other. In either case the parts of the mechanism are identical, and the arrangements and combinations of these parts are precisely the same; each part and each combination of parts, stand in precisely the same relation to each other; and each part and combination of parts, performs precisely the same functions before as after the proposed change.

To the twelfth interrogatory, the witness saith :

12. I think such a construction of the truck unfit for use, because,

1. The axles will be in danger of shifting their relative positions while in motion, by the elasticity of the spring.

2. The metal itself, when long in use, becomes less and less reliable, and hence the safety of the car is trusted to each spring.

3. The springs cannot keep the truck square.

4. In passing curves, the friction of the outer rail may compress the spring, and by its reaction tend to throw the truck off the track.

5. The impossibility of applying brakes without imminent danger of breaking the springs.

6. The use of springs, without side bearings to control them, would

permit the wheels to be thrown up by meeting uneven parts of the rails or small irregularities, and thus expose the wheel to be thrown from the track; whereas side-bearings prevent the springs from acting so sudden, as above explained.

To the thirteenth interrogatory, the witness saith :

13. It differs in various respects from the specification, and it shows various things not spoken of in that instrument. The drawing does not correctly represent any thing that is claimed in the claiming clause of the specification, as the invention of Winans; neither the mode of connecting the four wheels in each truck; nor the mode of connecting the trucks to the body; nor the arrangement of the wheels in relation to each other in space, they not being as near as might be in each truck without interfering (as a brake is inserted between them); and the two trucks not being placed in either of the positions required. There are various other differences that it may not be necessary to mention.

To the fourteenth interrogatory, the witness saith :

14. I have seen Chapman's patent.

To the fifteenth interrogatory, the witness saith :

15. I have examined the model K. It does accurately represent a railroad car shown in said book and drawings, so far as relates to the running gear and its connection with the body of the car.

To the sixteenth interrogatory, the witness saith :

16. In my judgment the arrangement and connection of the eight wheels with each other and with the body in the Chapman car, is so precisely the same as that in common use that it could require no invention from one to reproduce the other. The only difference of moment is, that the Chapman cars have centre as well as side bearings, while the cars of the Eastern Railroad and most if not all others have no or but little weight borne upon the centre, but it is all placed upon side bearings. The arrangement of wheels and their connection together in trucks, and their connection with the body, is the same, with the above exception.

To the seventeenth interrogatory, the witness saith :

17. It has side bearings, centre pivot and rigid rectangular wheel-frames.

To the eighteenth interrogatory, the witness saith :

18. I find by measuring the drawings, that, according to my best judgment, the distance of the bearing points of the wheels is about equal to the width of the track—a few inches less.

To the nineteenth interrogatory, the witness saith :

19. Changing the forward truck for a single axle fastened to the body, it represents the six-wheel truck.

To the twentieth interrogatory, the witness saith :

20. I have been long familiar with the treatise and drawings of Tredgold, and I there find drawings and description of a double truck eight-wheel car.

To the twenty-first interrogatory, the witness saith :

21. The twenty component parts of the car described in Tredgold's Treatise are : a long body, and two trucks; each truck is made of four wheels united by two parallel axles, and held in position by a wooden or iron frame, being rectangular and inflexible, and made to hold the wheels square on the track. The distance of the axles is just about equal to



the width of the track. The trucks are united to the body by a central bearing or thimble penetrated by a swiveling king-bolt or vertical axis; the trucks are placed so that the wheels are under the ends of the body and in such a position as best to support it, when braces are not used under the central part of it. The trucks are free to swivel laterally, so as to conform to any curves or inequalities of the road, in the same way as Chapman's, and the chief difference between them is, that the latter had side-bearings, the former did not.

To the twenty-second interrogatory, the witness saith :

22. I have examined the model marked A. It is a correct representation of said eight-wheel car of Tredgold. Model C is not a correct representation of any car described or shown by him, because it has not the vertical axis, or swiveling king-bolt.

To the twenty-third interrogatory, the witness saith :

23. In making a comparison of the car described by Tredgold with those in use on the Eastern Railroad, or in common use in the country, it is necessary to observe the conditions to which the cars were adapted. The diameter of the wheels on the common cars varies from 30 to 33 and 36 inches. The distance, from centre to centre, of the sleepers on which the rails of a railroad lay, were, several years ago, three feet; and lately, heavier loads are carried on railroads, and the distance has been reduced to about two and a half feet, from centre to centre, of the sleepers on which the rails lay. The class of railroad used in this country, is what was known, in 1825, and denominated by Tredgold, in his book of that time, as the "edge railroad;" and on page 31 of his treatise, on the subject of this kind of railroad, he says: "The length of each rail being nine feet it is supported at every three feet;" and on page 126, of the same book, he says: "The distance between the wheels of the carriages should be such, that the unsupported part of a rail should have to carry only one wheel." The distance of the bearing points of the wheels apart, in trucks of the eight-wheel cars now used on roads generally, is usually from 52 to 58 inches; and if the Rochester and Syracuse car be 54, the Tredgold 55, and the Hudson River baggage car 56 inches, between the bearing points of the wheels in each truck, the practical condition of the distance of the wheels apart, given by Tredgold in 1825, relatively to the space of the rails between the sleepers, viz., that one wheel only at a time shall be upon the space, is the same rule as that now practised with the eight-wheel cars in running on a road. If the wheels 30 inches in diameter, placed as near together as they can be, without the flanges touching, as directed by Ross Winans's specification, which, say, leaves half an inch space between the flanges, and the flanges are 1 1-4 inch each, the distance between the bearing points of the wheels would be 33 inches, and with the sleepers having a 3 feet span of rail, would bring two wheels on the same span, and this would be a violation of the Tredgold and the practical rule, and be too great a crushing force for a single span of rail, and would concentrate the crushing force too much on one portion of the rail, tending to spring and crush and destroy the rail, and derange the surface of the road. The rule of the distance apart of the wheels of the carriages, as laid down by Tredgold, is the proper rule, and the one actually practised by the railroad companies generally.

On pages 12 and 13 of Tredgold, as to the diameter of the wheels and the size of the axles, and the mode of their revolving, in use in England, Tredgold says: "In some parts, near the Straiths, we observed malleable iron rails in 15 feet lengths, supported at every 3 feet," and "the wheels of the coal waggons are 2 feet 11 inches in diameter," and "their axles are 3 inches in diameter, and revolve in fixed bushes;" and on page 94, after describing the eight-wheel car, he says, "the load on each wheel must be limited to suit the strength of the rails; it will seldom exceed two tons on a wheel, nor be less than half a ton." The size of the axles may therefore vary from 2.2 inches to 3.5 inches. The diameter of the wheels stated as in use by Tredgold, on the page 13, being 35 inches, is between two of the sizes 33 and 36 inches, used on the eight-wheel cars in this country, and the weight on each wheel, with the car loaded, is about two tons, and the diameter of the axles is 3 1-4 and 2 1-2 inches, and revolve in fixed bushes. In these respects also, the information, as proved facts given by Tredgold, and the practical use, in the eight-wheel car in this country, correspond. The eight-wheel cars in use also have the weight of the body equally divided among the wheels, which important purpose is also set out by Tredgold in his description of the eight-wheel car, in these words, page 94: "When a carriage has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels;" and on page 179, says, "so that the stress of each wheel on the rails of a railroad may be equal," in giving his description of the eight-wheel cars. This equal stress on the rails from equal weight on each wheel, is the same condition now existing in the eight-wheel cars in use. Also on pages 173 and 174, he speaks of the carriages being on springs; and on page 101, says, "In proportioning the body of a carriage, it should be kept in view that the load should be as low as possible;" and on pages 42 and 43, he says, "It often happens that a great part of the resistance of the rails arises from the lateral rubbing of the guides of the wheels; therefore, it is desirable to give the wheels a tendency to keep in their path with as little assistance from the guides as possible." "For edge rail carriages this may be accomplished by making the rims of the wheels slightly conical, or rather curved, as shown in fig. 24. The carriage will then return of itself to its proper position on the rails, if it be disturbed from it by any irregularity." This feature of the wheel, shown in the drawing, is also used on the eight-wheel cars.

These collections of ascertained facts as to the size and form of wheel, size of axles, their revolving in fixed bushes, distances of wheels apart, equal weight on the wheels, and hence equal stress amongst the wheels on the rails, disposition of the wheels as to the span of the rails, as practised by railroads, as well as the description of construction of the eight-wheel car, are given by Tredgold in 1825, sufficiently full and clear for a railroad company to construct the road, and build and use the car properly upon it, as they are used.

To the twenty-fourth interrogatory, the witness saith:

24. The Tredgold car is, in my judgment, well calculated to answer the purposes and objects set forth in said Winans's specification, as designed to be attained by him, either as a freight or passenger car. In common with the arrangements, as described in Winans's specification,

there is one peculiarity which should be remedied, whenever the car is to be run at rapid rates; that is to say: Tredgold and Winans both sustain the whole of the load upon bearings at the centre of the bolster, without side bearings. Side bearings must be used in running at rapid rates. In adapting the freight car of Tredgold for transporting passengers, springs must be used, as suggested by Tredgold's treatise; and thus arranged, the objects sought to be attained by the alleged improvements of Winans will be far better attained by the Tredgold car than by his.

To the twenty-fifth interrogatory, the witness saith:

25. I have examined the same. The drawings show an eight-wheel double-truck railway car, substantially embracing all of the general principles of construction of Winans's improvement, and some of his peculiarities of arrangement and connection; but it has not the spring truck, nor does it bear all the weight of the load upon the centre of the bolster; but it has extended bearings, resembling Imlay's transom plate. It also embraces an alleged improvement, not resembling Winans's, namely: that of allowing the axles to move forward and back on their bearings, so as to enable them to conform to the curves; or, in other words, to coincide with the radii of the curves; but this feature, in common with the same feature in Winans's (resulting from the use of springs), is dangerous. With these differences in detail, the car of Fairlamb is essentially the same as Winans's.

To the twenty-sixth interrogatory, the witness saith:

26. Undoubtedly he would; and with the alterations above suggested they would embody the principles and attain the results inquired of.

To the twenty-seventh interrogatory, the witness saith:

27. The body of the steam-carriage was long, so that it readily rested on two four-wheel trucks, allowing them to swivel to the curves without interfering with each other; and the distance of the bearing bolsters was nearer to the ends of the body than the position now usually adopted in passenger cars, from the end of the body platform. The two trucks were placed so near the ends of the steam carriage, that the ends of the truck frames projected beyond the body; and this position was best calculated to sustain the weight of the body. A part of the body hung down between the two trucks. Each truck had a bolster running across the centre of the same, from side to side, and this bolster was connected with an upper bolster, on which the steam carriage rested by means of a large swiveling pivot or king-bolt, operating also as a transom plate, and the trucks swiveling readily and freely to the curves and other inequalities of the road. There were also anti-friction side bearings upon each truck, to keep the body of the steam carriage from rocking, and assist in supporting the same. The truck frame is united to the axes of the wheels by means of springs and pedestals, similar to those now in general use, which, while it gave ease of motion to the burthen carried, effectually prevented the axes from, at any time, losing their parallelism, by confining the motion allowed by these springs at all times to planes perpendicular to the track and equidistant from each other; thus the wheels were always kept square on the track. The fore and hind wheels of the truck were of different diameters; but this fact is wholly immaterial. I have examined them. The said steam carriage is borne by two trucks; each truck has four



wheels, in a rectangular rigid wheel-frame, which preserves the parallelism of the axes; the points at which the wheels bear upon the rails are about equal to the width or gauge of the track, which distance is the most beneficial in actual use. The whole of the objects or beneficial results set out in said Winans's patent, and much more, are embodied in said Allen's steam carriage. The said steam apparatus may be taken off, leaving the bolsters and all other parts as they were, and a platform or body for passengers substituted, without invention, and this carriage will then, as it did before, combine all the mechanical elements of the eight-wheel railroad passenger car, as ordinarily used, embodied in a manner exceedingly well adapted to pass smoothly, steadily and safely over the straight track as well as the curves and irregularities of railroads, and indeed contains all the most essential features of the running gear now in general use, and is far better calculated to attain the objects described in said Winans's specification, than the mode of arrangement which is recommended in the patent itself.

To the twenty-eighth interrogatory, the witness saith:

28. I have examined it. It contains two trucks, one at each end of the bearing platform, swiveling under it, upon the king-bolts. It also contains a long bearing platform, which is made of solid timbers fastened together by two cross pieces at the ends; which, while they unite these long timbers, at the same time constitute the bolster pieces. These bolster pieces are penetrated by king-bolts, which pass through these, and through the middle of the ends of the centre timber; the under part of each bolster is rounded up, and it is also armed with a transom plate and side bearings, which correspond to similar transom plate and side bearings upon the trucks underneath. Each truck has four wheels, and a solid, rigid rectangular wheel-frame, covered by a solid platform, and said wheel-frames have side pieces and double cross bolsters. The axletrees on which the wheels revolve are metal, and bedded in the cross timbers at each end of the wheel-frame. The bearing points of the wheels on either side of the truck, are about the same distance from each other as the width or gauge of the track. The diameter of the wheels is smaller than those in general use at the present time. The trucks are coupled sufficiently remote from each other to allow each to swivel entirely around without interfering one with the other. In regard to its mode of operation, it is precisely the same in principle as the eight-wheel cars now in common use; the bearing points of the wheels being equidistant with the gauge of the track, and the two trucks placed at or near the ends of the bearing platform, adapts this car to an equal distribution of the weight to be carried upon the rails, while the swiveling of the truck adapts it to pass smoothly and safely over the straight parts, curves and other inequalities of the road, and the peculiar shape of the bolster adapts it to conform to great and sudden changes of grade, and the side bearings to prevent the body from swaying or tipping one way or the other.

To the twenty-ninth interrogatory, the witness saith:

29. All that is material and essential in the arrangement of the eight wheels of the car, and the connection thereof with the body, is there reduced to practice in a manner which obtains all the advantages, while it avoids the defects of the arrangement as shown in said Winans's specification. The trucks are placed as far apart as the length of the body will permit, and the wheels are brought so near together that



their bearing points are as far apart as the width of the track ; and this arrangement, on the whole, is better than a closer proximity of the wheels. It does not contain the peculiar mode of uniting the axles of the wheels by a spring bolted to the boxes, and owing to the small size of the wheels the flanges are not brought as near as possible without coming in contact.

To the thirtieth interrogatory, the witness saith :

30. Various improvements have been applied to modern cars in addition to what is in the Quincy car, but the arrangement of the wheels and construction and connection of the truck with the body of the car, still remains the same in its essential character. And no invention would be requisite so far as regards the arrangement of the wheels and the connection of the trucks with the body of the cars, to swivel to the curves and run safely and smoothly on the road.

To the thirty-first interrogatory, the witness saith :

31. I have seen the aforesaid works ; said mode of coupling was familiar and publicly used and shown.

To the thirty-second interrogatory, the witness saith :

32. I have examined the said works ; the bearing points appear to be about equal to the gauge or width of the track ; the same as now used by the best constructed cars.

To the thirty-third interrogatory, the witness saith :

33. Such springs and pedestals were described and shown in the manner inquired of.

To the thirty-fourth interrogatory, the witness saith :

34. The wheels and axles revolving together, and also the wheels revolving on fixed axles, were both well known equivalents before the year 1830, and are described in Tredgold, Wood and Strickland's treatises.

To the thirty-fifth interrogatory, the witness saith :

35. None of the foregoing changes involve any thing else than an alteration of the proportions, or substitution of well known equivalents for each other. It would, therefore, require no invention whatever to make these changes.

To the thirty-sixth interrogatory, the witness saith :

36. The distance of flanges is not material ; the distance of the treads is ; varying the size of wheel varies the space between the flanges—not the treads.

To the thirty-seventh interrogatory, the witness saith :

37. It is because these are the only points of contact between the car and the rails.

To the thirty-eighth interrogatory, the witness saith :

38. It is essential and material to the good operation of a truck, that the axles should be held rigidly equidistant from each other ; if they are not, there will be great unnecessary friction between the flanges and rails, unsteadiness of motion of the truck and body, and great danger of the truck leaving the track.

To the thirty-ninth interrogatory, the witness saith :

39. I do not recollect any other facts that may be material, except those relating to the proceedings made to obtain an extension of the t. I was in the City of Washington in the month of March, patent and there went to the Patent Office, for the purpose of examining 1852,

ing the files and records in that office, relative to the patent of Ross Winans, of October, 1834, being the same patent under which this suit is brought. I carefully examined the papers and records of the office, in the matter of the extension of the said patent; and there saw the official order for a publication of a notice in the newspapers, made by the Commissioner of Patents, on the presentment of the petition of the said Ross Winans, for an extension of the said patent. I copied the order, and then went to the office of the Union, a paper printed and published in the City of Washington, and which is one of the papers referred to in the said order, and examined the file of said paper for the year 1848. I found in the Union of the fourth of June, a notice of which the following is a copy:

“PATENT OFFICE, June 3d, 1848.

“On the petition of Ross Winans, of Baltimore, praying for the extension of a patent, granted to him on the first of October, 1834, for an improvement in ‘railway cars and carriages,’ for seven years from the expiration of said patent, which takes place on the first day of October, 1848, it is ordered, that the said petition be heard at the Patent Office, on the third Monday of August (twenty-first) at twelve o’clock, M., and all persons are notified to appear and show cause, if any they have, why said petition ought not to be granted.

“Ordered, also, that this notice be published in the Union, Intelligencer, and Democrat, Washington; Argus, Baltimore; Pennsylvanian, Philadelphia; True Sun, and Sun, New York; Post, Boston; Gazette, Portsmouth, N. H.; Post, Pittsburgh; and Inquirer, Cincinnati; once a week, for three successive weeks; the last publication whereof to be at least sixty days previous to the said third Monday of August next.

“EDMUND BURKE, *Commissioner of Patents.*”

“P. S. Editors of the above papers will please copy, and send their bills to the Patent Office, with a paper containing this notice. June 4, w3w.”

The foregoing is also a copy of the original order, now in the Patent Office, except the printer’s note at the end, “June 4, w3w.” The fourth of June, 1848, the day of publication of the first notice in the Union, was Sunday. It was afterwards published in the Union of the eleventh and eighteenth, and also of the nineteenth of June. I then went to the office of the Intelligencer, another paper referred to in said order, and was furnished with the file of said paper for the year 1848, by Joseph Gale, senior publisher of the said paper. The notice could not be found in that paper. I searched the said file carefully, and could not find any notice of the application of said Ross Winans for an extension of his patent published in that paper; I then referred to Mr. Gale for information, who examined his books and the paper, and he informed me that no publication of the kind was made in the Intelligencer. I inquired for, but was unable to find the office of the Democrat, in the city of Washington. I then went to the office of the Argus, in Baltimore, and examined the file of said papers carefully, and found that the same notice, of which a copy is given above, or an order, as it may be, was published in that paper on the fifth, fourteenth, twentieth and twenty-eighth of June, 1848.

I then went to the office of the *Pennsylvanian*, in Philadelphia, and on searching the file of the said paper, I found the said notice or order published in that paper, on the sixth, thirteenth, and twentieth of June, 1848. I then went to the office of the *Sun*, in New York, and fully and carefully searched the file of that paper for the year 1848, but could find no such notice or order therein. I then applied to the book-keeper for information, whether the publication of any such notice had been charged on the books. He informed me that there was no such charge on the books, and that the notice was not published in the *Sun*. The *True Sun*, mentioned in the official order, was a different paper, published for a very short period, and was of very small circulation. After much search and inquiry for the files of this paper, I found a regular file of them for the year 1848, in the New York Library, corner of Leonard Street and Broadway, and the same notice was published in the papers of the seventh, sixteenth, and twenty-second of June, 1848. I believe that the circulation of the *True Sun* was very small; that the paper existed for a short time only; and that persons interested adversely to said proposed extension, would not be at all likely to see a notice in that paper, on account of its ephemeral character. I next examined the files of the *Boston Post*, at the office of that paper, and found that the same notice or order was published in that paper for three weeks, commencing June seventh, 1848. I have a letter from the publisher of the *Gazette*, at Portsmouth, N.H., stating that the same notice or order was published in that paper on the thirteenth, twentieth, and twenty-seventh days of June, 1848, and in the paper of July 4th, of the same year. I have also received a letter from the office of the *Enquirer*, of Cincinnati, stating that the same notice or order was published in that paper, on the ninth, seventeenth, and thirtieth days of June, and on the sixth day of July, in the year 1848. I also received a letter a letter (?) from the office of the *Post*, Pittsburgh, stating that the same notice was published in that paper, on the 12th, 20th, and 27th days of June, 1848. I believe that the information contained in the said letters, as to the publication of the notice or order, in the several papers above referred to, is correct. I have never found or heard of any other notice or order of the application of the said Ross Winans for an extension of his patent, than the one of which a copy is above given, and I do not believe that any other was given or published. I never saw or heard of the said order or notice during its publication, nor did I ever see it at any time before I searched for it at Washington, and at the other places named. I did not know that an application for an extension of the said patent was made, or pending, or that the patent purported to have been extended, until long after it was alleged that it was extended. The examination of the newspapers above mentioned as searched by me, and each of them, was made by me with great care, and with sufficient time. I am confident that no kind of order or notice of the application of said Ross Winans, for the extension of the said patent, was ever published in the *Intelligencer*, at Washington, or in the *Sun*, in New York.

From the phraseology of the notice or order published, it does not appear, nor would any one be likely to suppose, that the application was for the extension of an alleged patent for an eight-wheel car, as such, or as distinguished from the numerous improvements made in railway



cars, and patented in the United States; and the subject or title of the patent, as stated by the order and published notice, is not the same as the subject or title borne by the Letters Patent, but is so different that it would not appear to be for the same character of patented things, the notice being as for an improvement on a constructed car or carriage, already running on railways at the date of the patent; while the patent is for the construction of cars or carriages intended to run on railways. The publication of such a notice, in the State of New York, in no other paper than the *True Sun*, was rather calculated to conceal the notice of the real application from the public and railway companies in the State of New York, who were the persons most interested adversely to the proposed extension, and which, also, was an important section of the country interested adversely to the proposed extension. I never heard, nor do I believe, than any railroad company, or any officer thereof, in the State of New York, had any knowledge of the pendency of the said application. The papers on file in the Patent Office, do not, as far as I can find, show that any other person than William Raymond Lee, of Boston, opposed the extension. The said Lee made a brief affidavit, showing that said Winans had not claimed the practical eight-wheel car as his invention, as against the railroad companies using such cars; and he employed Richard Cox, Esq., as Counsel, who opposed the extension, on behalf of the Boston and Providence Railroad Company, of which Mr. Lee was the Superintendent, on the ground that the Chief Clerk had no authority to act, and could not grant the extension. The said Counsel did not press or urge any other ground of objection, and I believe that no other opposition or objection to the proposed extension of the patent was made.

To the fortieth interrogatory, the witness saith:

40. The theory and plan of Winans, for constructing his improved car is, in my opinion, unsound, and when applied to practice pernicious and dangerous.

To the cross-interrogatories on the part of the Plaintiff, the witness cross-answers as follows:

To the first cross-interrogatory, the witness saith:

1 X. I have stated my experience in answer to the second direct question.

To the second cross-interrogatory, the witness saith:

2 X. I have, in the manner stated in the answer to my second direct question.

To the third cross-interrogatory, the witness saith:

3 X. I have in one case, relating to machinery.

To the fourth cross-interrogatory, the witness saith:

4 X. I have been accustomed to do so for several years.

To the fifth cross-interrogatory, the witness saith:

5 X. It was not a special part of my duty to attend to the construction and arrangement of running gear of railroad machinery when I was engaged in that branch of business. I am not now engaged in superintending any railroad.

To the sixth cross-interrogatory, the witness saith:

6 X. I am acquainted with and fully understand the principles involved in the construction and operation of railroad cars; and I have



such a knowledge of the subject as will enable me to compare the different construction of cars, and to judge whether they will answer the purposes required of railroad cars, under high rates of speed, &c.

To the seventh cross-interrogatory, the witness saith :

7 X. A car should move on all parts of the road with as little friction as possible between the flanges and rails; unless in attempting to avoid friction between them, you should violate some other principle required to be observed in making a practical working machine.

To the eighth cross-interrogatory, the witness saith :

8 X. Yes, sir.

To the ninth cross-interrogatory, the witness saith :

9 X. No, sir.

To the tenth cross-interrogatory, the witness saith :

10 X. No, sir. The greatest freedom of motion, would in no case be allowable; and if allowed it would be attended with much more unnecessary friction between flanges and rails, than if that freedom were controlled by side bearings and other means.

To the eleventh cross-interrogatory, the witness saith :

11 X. I am. My means of knowledge are : the study of the physical sciences in the books, my professional education, and my personal experience and observation, and many years' association with others who are engaged in similar pursuits.

To the twelfth cross-interrogatory, the witness saith :

12 X. Steadiness of motion is a great desideratum in all railroad cars; but steadiness of motion is not solely dependent upon a great length of body. The four-wheel cars on the English roads, which have not bodies of great length, are said to run as steady and smoothly as the long cars in this country. Steadiness of motion depends upon a great variety of circumstances, independent of length of the body. A very short or a very long body would each have its disadvantages. It is a very great mistake to suppose that the easy motion of the eight-wheel cars is according to length of body.

To the thirteenth cross-interrogatory, the witness saith :

13 X. Certainly, if the car is to work in a train.

To the fourteenth cross-interrogatory, the witness saith :

14 X. It is not. The only rule to be observed is, that the first truck shall have sufficient freedom of motion. The rear truck in a train usually is the most unsteady, and the rear end of the last car the most disagreeable to ride in, because the truck has more freedom of swiveling and bobbing about than any other truck in the train.

To the fifteenth cross-interrogatory, the witness saith :

15 X. No, sir. It is not essential, in order to give sufficient freedom of motion to answer all practical purposes.

To the sixteenth cross-interrogatory, the witness saith :

16 X. The area of the bearing surface represented upon the model is but little less than that shown by the drawing. The bearing is very narrow in the drawing, although it extends about two-and-a-half feet. In one direction it is not more than four or five inches wide. So that the area would be not far from one foot, while the area represented on the model will be about the same. But both the drawing and model represent quite as much bearing as can be said to be consistent with the

direction of the specification, to bear all the load on the centre of the bolster.

To the seventeenth cross-interrogatory, the witness saith :

17 X. No, sir.

To the eighteenth cross-interrogatory, the witness saith :

18 X. Yes, sir.

To the nineteenth cross-interrogatory, the witness saith :

19 X. They, or some substitute, are essential to the comfort of a passenger car.

To the twentieth cross-interrogatory, the witness saith :

20 X. It represents a railroad car with four wheels ; also, a car with six wheels, and the description shows the mode of constructing a car of eight wheels. The language is to be found in the first paragraph of page 159 of the printed copy of the patent annexed to this commission. The draft was by the body, and when it was used to carry the apparatus for motion in or on the car, the manner of applying the draft is shown in the figure 1, at the top of the plate. When the apparatus for locomotion was not carried in the car, I presume the mode of draft was in the usual way—by the body. But the drawings do not show the application of the draft to the six-wheel car nor the eight-wheel car.

To the twenty-first cross-interrogatory, the witness saith :

21 X. There is no representation of the mode of draft upon the drawing of the eight-wheel car in Tredgold. I have considered the model A as just in this respect, because no other mode of draft was shown except that in another part of the work of Tredgold ; and that mode is represented in other plates in the book.

To the twenty-second cross-interrogatory, the witness saith :

22 X. There is. I have, in my former answers, referred to the swiveling axes, and the thimble or socket on which the trucks swiveled, shown in the drawing, at A, A.

To the twenty-third cross-interrogatory, the witness saith :

23 X. There were, in Allen's carriage, two trucks swiveling under one body. The wheels in each truck were only one foot apart, the bolsters were placed near the ends of the body, and the trucks were connected with a king-bolt and centre-bearing. The objects and purposes of the arrangement and connection of the running gear was the same in Allen's as in Winans's patent. The structure differed in details. Allen had the solid rigid square truck-frames, with spring pedestals and side bearings. In these respects he differed from Winans.

To the twenty-fourth cross-interrogatory, the witness saith :

24 X. I have fully answered the question to the best of my ability, in my answer to the twenty-ninth direct question.

To the twenty-fifth cross-interrogatory, the witness saith :

25 X. If a mechanic had been well enough informed as to what was necessary in order to build a car that would move safely and smoothly over the curves and irregularities of a railroad, at ten or fifteen miles per hour, to be enabled to construct an eight-wheel double-truck swiveling car, as he certainly could have done, he would then have been able to make a car such as would be suitable to run at much higher rates ; because when he had reached the point of building a double-truck car, he had attained all that was essential to enable it to run at any given speed. Experience would undoubtedly add to his knowledge

as to the relative strength of parts and adjustment of details, as it always does in the continued use of all descriptions of machinery; but all that required invention was embodied in Chapman's patent, Tredgold's treatise, or the Allen carriage, or the Quincy car. No change of principle has been required to adapt these cars to running at the present rates of speed; and the same is the case with the four-wheel cars; they are the same thing, while as now frequently run at forty miles per hour, as when they were drawn by horse power.

To the twenty-sixth cross-interrogatory, the witness saith:

26 X. I do, considered in relation to the subject now under consideration.

To the twenty-seventh cross-interrogatory, the witness saith:

27 X. To the perch, I have been told.

To the twenty-eighth cross-interrogatory, the witness saith:

28 X. No, sir. Different ways of draft have different advantages.

To the twenty-ninth cross-interrogatory, the witness saith:

29 X. Tredgold shows a train of four-wheel cars drawn by the body. He does not show any mode of drawing the eight-wheel car. The other treatises show only four-wheel cars drawn by the body.

To the thirtieth cross-interrogatory, the witness saith:

30 X. No, sir. One instance to the contrary is the Chapman car. No mode of applying the draft to the truck is represented in the drawings or the description. I do not, at this moment, recollect any other instance; and even in this case, it is necessary to take all the figures of the plate in Chapman's patent in connection, in order properly to say that draft by the body is there represented. But if the eight-wheel car is constructed according to the drawing and specification, it must be drawn by the body, or by something attached to the body, and not by the trucks.

To the thirty-first cross-interrogatory, the witness saith:

31 X. No, sir. This result supposed in the question would not follow from the placing the wheels near together, as supposed.

To the thirty-second cross-interrogatory, the witness saith:

32 X. No, sir. This great length of the body, and supporting it at the ends upon two trucks thus constructed, would not result in stability or steadiness of motion.

To the thirty-third cross-interrogatory, the witness saith:

33 X. No, sir. The trucks must not have the greatest possible freedom of motion, to produce that result.

To the thirty-fourth cross-interrogatory, the witness saith:

34 X. The description of the cars, before mentioned in my answers, are such as are well adapted for that purpose, as I have already explained.

To the thirty-fifth cross-interrogatory, the witness saith:

35 X. No, sir. The Chapman carriage, the Tredgold car, the Quincy car, and the Allen steam carriage, are all instances to the contrary. They all had for one of their objects, the distribution of the weight of a load upon eight instead of four points of support upon the rails and wheels. Another of their objects was, to be enabled to support and transport much larger loads, by the use of longer and larger carriages than the four-wheel cars and carriages. But another of the objects, which was equally important and essential, and without which



these structures would have been useless and impracticable, was so to arrange and connect the wheels with each other, and with the bearing carriage-body or platform, as to enable these long bodies, with heavy loads, to be transported with ease and steadiness of motion, at any rate of speed which might be attainable, and to enable them to adapt themselves to all the curvatures and irregularities of the roads, and to carry their burthen as safely and smoothly as possible. I can conceive of no other object in putting in swiveling trucks, except to accomplish these purposes; and in some of the treatises, as in that of Tredgold, he particularly mentions these very difficulties of curves—not only simple, but curves of double curvature, changes of grade and inequality of rails, evidently having in mind all the conditions to which the eight-wheel car must adapt itself in running on railroads, as ordinarily constructed. These opinions I found not only on the language of Chapman and Tredgold, and on my knowledge of the Allen carriage, the Quincy model, but upon the drawings in the treatises referred to. The authority to which I refer more particularly, so far as relates to Chapman and Tredgold, is indicated in the printed patent and drawings, and in the extracts from Tredgold annexed to the commission.

To the thirty-sixth cross-interrogatory, the witness saith :

36 X. I have no reason to believe that the eight-wheel cars inquired of, were employed previously to 1830, to carry weights that could not be subdivided and carried on four-wheel cars. Such waggons as Chapman's and Tredgold's, seem to be adapted to carrying any species of freight; such as coal, luggage, &c., and I do not find any thing to support the idea that the freight could not be subdivided.

To the thirty-seventh cross-interrogatory, the witness saith :

37 X. I have never been so employed. I am in no way connected with this case, nor interested in any way in its result.

To the thirty-eighth cross-interrogatory, the witness saith :

38 X. I am connected with railroads only as a director.

To the thirty-ninth cross-interrogatory, the witness saith :

39 X. I have not formed the opinions inquired of.

In answer to the further direct interrogatories on the part of the Respondent, the witness saith :

To the first interrogatory, the witness saith :

1. I have been, since 1837, President of the Syracuse and Utica Railroad Company. I have at all times sought to be fully informed as to all matters interesting in the management of railroads. I have travelled over a large part of the railroads in the United States, and have observed that eight-wheel cars are in general use. I believe that they are used in almost every State east of the Mississippi. They have been in general use as fast as railroads have been opened over the whole country, since 1840.

The Plaintiff has been for many years engaged in building locomotive engines in Baltimore. He made a number of a peculiar kind, for the Western Railroad in Massachusetts, and which were put upon that road when it was first opened through to Albany, and which, I think, was about 1841 or 1842. These engines excited much attention at the time, and were commonly called "Crab Engines." They did not succeed, and the plan was considered a failure. This made the name,



business, and residence of the Plaintiff very familiar with most persons connected with railroads in the Northern and Eastern States. Though I had such knowledge of the Plaintiff, and had purchased and used eight-wheel cars for several years, and had seen them in general use. I never heard or had any intimation that the Plaintiff claimed a patent therefor until about the time the suit had been commenced against the Schenectady and Troy Rail Company, which I believe was in 1847.

To the second interrogatory, the witness saith :

2. This I answer in the negative.

To the third interrogatory, the witness saith :

3. It would not.

To the fourth interrogatory, the witness saith :

4. There is not.

To the fifth interrogatory, the witness saith :

5. I make the same answer as above.

To the sixth interrogatory, the witness saith :

6. I repeat the same reply.

To the seventh interrogatory, the witness saith :

7. No, sir.

To the eighth interrogatory, the witness saith :

8. The theories are entirely different; and that difference is essential.

To the ninth interrogatory, the witness saith :

9. No, sir.

To the tenth interrogatory, the witness saith :

10. It is not.

To the further cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

To the first further cross-interrogatory, the witness saith :

1 X. The theory of the close proximity of the wheels in each truck; the making the truck with spring connections of the axles, instead of with wheel-frames; the connection of the body with the trucks, by a centre bearing, and dispensing with side bearings; the theory of attempting to make the axes of the wheel more nearly coincide with the radii of the curves, by bringing the flanges of the wheels close together, when the truck is in actual motion on the track; the theory of making the two wheels so near together as to resemble, as nearly as possible, a single wheel—I mean to say that whatever view may be taken of these theories, as abstract principles, I consider them entirely erroneous, as applied to practice, in the manner and by the means set forth in the specification, or in any other way that is substantially the same or analogous to it. In my opinion, the objects sought to be obtained by the patentee, are not and cannot be obtained by building a car according to the directions of the specification.

To the second further cross-interrogatory, the witness saith :

2 X. The rates of speed of the railways were quite different, according to the purposes they were used for. There was no rate that could be called the average speed of all the railways, if I understand the question. On some of them the speed was three to four times as great as on others.

To the third further cross-interrogatory, the witness saith :

3 X. All railways before 1830, and all railways ever since that date, are so constructed that they require the most favorable distribution of the weight of cars and locomotives.

To the fourth further cross-interrogatory, the witness saith :

4 X. Two only, that I recollect—the Stockton and Darlington, and the Liverpool and Manchester.

To the fifth further cross-interrogatory, the witness saith :

5 X. No, sir. Steam power by locomotives and stationary engines were introduced before that time.

To the sixth further cross-interrogatory, the witness saith :

6 X. The average speed of freight cars was from five to six miles, and of passenger cars from twelve to fifteen miles per hour.

To the seventh further cross-interrogatory, the witness saith :

7 X. I have not.

JOHN WILKINSON.

Subscribed and sworn to before me, Nov. 15, 1853.

JOS. F. SABINE, *Com'r, &c.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 15th day of November, A. D. 1853, John Wilkinson, of the city of Syracuse, in the county of Onondaga, and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States, within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my office in the city of Syracuse and State aforesaid, and was sworn according to law, and carefully examined on oath, agreeably to the directions of the said Court. And the foregoing deposition, given by him in my presence, was reduced to writing, by me and by my clerk, in my presence, before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 16th day of December, A. D. 1853.

JOSEPH F. SABINE, *Com'r.*

DEPOSITION OF JEREMIAH VAN RENSSELAER.

Jeremiah Van Rensselaer, a witness, being duly sworn, to the direct interrogatories on the part of the Respondents, answers as follows :

To the first interrogatory, the witness saith :

1. My name is Jeremiah Van Rensselaer ; age forty years ; residence and place of business Saratoga Springs ; occupation, civil engineer and railroad superintendent.

To the second interrogatory, the witness saith :

2. I was connected with the Camden and Amboy Railroad, as engineer, from 1830 to 1834 ; from 1834 to 1840, on railroads in Louisiana and Mississippi ; since then on railroads in New York and New

Jersey; during which time I have had the means of acquiring practical and theoretical knowledge concerning railroad machinery.

To the third interrogatory, the witness saith :

3. I am.

To the fourth interrogatory, the witness saith :

4. I have examined said specification.

To the fifth interrogatory, the witness saith :

5. I have examined the model B, now shown to me, and should think it fully corresponded with the specification.

To the sixth interrogatory, the witness saith :

6. Each truck should have a substantial, unyielding frame, to hold the axles parallel; the wheels should be as far apart as the width of the track. The trucks should be connected to the body, near its ends. The body should rest on a bolster, with a king-bolt or transom in the centre, to allow the trucks to turn freely in passing the curves, and going over inequalities of roads; and have side bearings, to prevent the body from rocking, and to steady the trucks when in motion. An eight-wheel car, made in this manner, (which I consider essential and elemental,) will run smoothly, evenly, and safely, over curves, straight track, and inequalities.

To the seventh interrogatory, the witness saith :

7. They have many; swinging bolsters, side bearings, safety beams, modes of draft by the body or king-bolt, brakes, spring bumpers, various improvements in boxes, wheels, &c., &c.

To the eighth-interrogatory, the witness saith :

8. They are. They are placed, say from five to seven feet from the ends of the body or platform.

To the ninth interrogatory, the witness saith :

9. They do; and are indispensable to prevent the body from too great oscillation.

To the tenth interrogatory, the witness saith :

10. They do; to hold the truck from turning round when thrown from the track, and for other purposes.

To the eleventh interrogatory, the witness saith :

11. It does not. No exercise of invention would be requisite to make the change.

To the twelfth interrogatory, the witness saith :

12. Axles of wheels, connected by a long spring, would not answer to run on a railroad. It is absolutely requisite that the axles be fixed and rigid, to withstand the numerous and severe wrenches that trucks are subject to, in running at high rates of speed when passing over the uneven surface of the track. If the brakes were applied suddenly, to arrest the speed of the train, they would be very likely, at times, to wrench off the springs near the wheels, and if the springs should break, from any cause, the consequences to passengers would be frightful. I would not suffer a truck with the axles coupled by a spring, instead of being held in a frame, to run on a road over which I had control.

To the thirteenth interrogatory, the witness saith :

13. I have examined the drawing, and find that it differs essentially from the specification. It has rigid wheel-frames which hold the axles parallel, and keep the wheels from being wrenched out of square.

The wheels in each truck are not as close together as recommended by Winans; a break is clearly perceptible between them. It is a freight car, and not a passenger car, as he described. It has a spring on each end of the axle of the wheel, instead of a long spring connecting the axles. It is drawn by the ends of the body; no mode of draft is mentioned in the specification. There are other differences of minor importance; but these I have mentioned are essential.

To the fourteenth interrogatory, he saith :

14. I have seen a copy of said work, shown to me by the Commissioner, and attached to the commission, which contains the specification and drawing of W. & E. W. Chapman.

To the fifteenth interrogatory, the witness saith :

15. I have examined model K, and it truly represents the eight-wheel car described by the Chapmans. A six-wheel car is shown in the drawing, and the description points out the mode of change from one to the other.

To the sixteenth interrogatory, the witness saith :

16. I think he would.

To the seventeenth interrogatory, the witness saith :

17. It has; and they are clearly shown and described.

To the eighteenth interrogatory, the witness saith :

18. It is precisely the same by measurement.

To the nineteenth interrogatory, the witness saith :

19. It can, by substituting two wheels in the place of one of the truck-frames.

To the twentieth interrogatory, the witness saith :

20. I have; and find an eight-wheel double-truck swiveling car. It has the four-wheel rigid truck-frame, to hold the axles parallel; and the bearing points of the wheels are as far apart as the width of the track.

To the twenty-first interrogatory, the witness saith :

21. It has a centre pin, or king-bolt, around which the body rests, and by means of which the truck-frames are allowed to turn, to suit the changes of level, divide the pressure equally among the wheels, and traverse the road. These trucks are placed under each end of the body, sufficiently far apart to allow them to swivel freely, without interfering with each other.

To the twenty-second interrogatory, the witness saith :

22. I have examined both of said models. Model A is an accurate representation of the eight-wheel carriage described by Tredgold. The single circle on the side piece is a joint bolt to hold the tenon of the usual cross-piece of the wheel-frame in its mortice; and the four vertical lines with rounded end, to each wheel-frame, is the axis on which it turns, and the socket on which the body rests; and is the same principle of construction, both in detail and in the combination or organization of the car, as the eight-wheel cars now in general use, to turn the curves of the road, and run smoothly and safely on the track. Model C is not what is described by Tredgold's book, and will not act as he describes or requires in his statement. It does not correspond with his description nor his drawing. No such car ever existed that I know of, to run on a railroad as a carriage.



To the twenty-third interrogatory, the witness saith :

23. I have answered this in the last answer.

To the twenty-fourth interrogatory, the witness saith :

24. It is.

To the twenty-fifth interrogatory, the witness saith :

25. I have examined said letters patent and drawing. The swiveling part—two four-wheel trucks, placed remotely from each other, with the body or frame resting on them, near their ends. The wheels in each truck are nearer together than in general use, but further apart than in Winans's. The axles are not held parallel, and it is intended one side of the wheels shall slide in a socket, in passing curves. The arrangement and combination of the wheels with the body, the swiveling character of the trucks, their being placed under the ends of the body, and remote from each other, gives it all the advantages claimed by Winans, in his specification, for an eight-wheel car.

To the twenty-sixth interrogatory, the witness saith :

26. I think he could.

To the twenty-seventh interrogatory, the witness saith :

27. I have examined said drawings, G and H, and they represent an eight-wheel steam carriage, with two four-wheel trucks, to turn to the curves and changes of the track. It has all the essential construction, arrangement and combination of the eight-wheel car or carriage, for freight and passengers, now in use; and is the same substantial combination, for the same or similar general purposes, of a railroad carriage, to turn the curves and travel safely on the road. It may be made to carry passengers, if desired, by providing it with seats on the top of the body; or putting a box on the bolsters, instead of the body there now, would make it exclusively a freight or passenger car, but would be no invention. No new combination or principle of construction or action, would be developed by such addition or alteration, in either case.

To the twenty-eighth interrogatory, the witness saith :

28. I have examined said model, marked "G. Bryant." It has two four-wheel trucks, with rigid wheel frames and cross-pieces or bolsters, and is connected by a platform body, with centre pivots or king-bolts passing through the upper and lower bolsters, in the centres of the trucks, and has side bearings, moving on curved plates on the trucks. The trucks swivel under the platform body, to conform to the curves of the road, the same in principle as the eight wheel cars now in general use. The wheels in each truck are held square on the track by the rigid wheel frames, and the bearing points of the wheels in each truck are distant about five feet, the same as the breadth of the track. The principle of the construction and operation of the eight-wheel car to turn curves, and run safely, now in general use on the railroads of this country, conveying freight and passengers, is contained in this truck. The wheels turn on the axles instead of revolving with them; and it has no springs.

To the twenty-ninth interrogatory, the witness saith :

29. All that is essential to enable a car to pass curves easily, and run smoothly on the road, is contained in the Bryant car. The combination of eight wheels in two bearing trucks, placed under the ends of the body, to run at high velocities, smoothly and evenly, is contained in the

car, I should think. The wheels turn on the axles, and it has no springs.

To the thirtieth interrogatory, the witness saith :

30. I think he would, without doubt.

To the thirty-first interrogatory, the witness saith :

31. I have. The mode of draft from the ends of the body is shown on plates, in both said works.

To the thirty-second interrogatory, the witness saith :

32. I have, and find the distance of the wheels apart about equal to the gauge of the track.

To the thirty-third interrogatory, the witness saith :

33. They were, as is distinctly shown in the London edition of Wood, of 1831, and in Allen's carriage.

To the thirty-fourth interrogatory, the witness saith :

34. It was. I do not know that they were publicly known prior to 1830.

To the thirty-fifth interrogatory, the witness saith :

35. I answer, it does not, to all the questions.

To the thirty-sixth interrogatory, the witness saith :

36. The distance of the flanges apart is not essential, but the distance of the bearing points of the wheels is. The distance of the flanges can be changed by altering the size of the wheels.

To the thirty-seventh interrogatory, the witness saith :

37. It is. It makes the truck run more steady, and less liable to be thrown from the track, when coming in contact with the various obstructions that are presented to the wheels in motion on the road.

To the thirty-eighth interrogatory, the witness saith :

38. It is essential and material to have the axles of the wheels in each truck, maintained at fixed and uniform distances from each other. Unless they are so held, the truck moves unsteady, and the friction is very much increased between the flanges and the rails, and the cars would be rendered dangerous and unfit for use.

To the thirty-ninth interrogatory, the witness saith :

39. I never knew of Winans making any claim for an infringement of his patent, until after the commencement of the suit against the Schenectady and Troy Railroad.

To the fortieth interrogatory, the witness saith :

40. I do not think Winans's theory sound. A car constructed on his plan, would not be practical or safe to run upon a road at high velocities. Experience shows that a flexible truck would be so much twisted by the severe wrenches that it is subject to, that it could not be kept on the track.

To the cross-interrogatories on the part of the Plaintiff, this witness answers as follows :

To the first cross-interrogatory, he saith :

1 X. I have answered this in my answer to the second direct question.

To the second cross-interrogatory, he saith :

2 X. I have been and am now conversant with the construction of the running apparatus of railroad cars. I have, as superintendent of railroads, given much attention thereto, for many years.

To the third cross-interrogatory, the witness saith :

3 X. I have not.

To the fourth cross-interrogatory, he saith :

4 X. I have, to some considerable extent.

To the fifth cross-interrogatory, he saith :

5 X. It has. I have planned and superintended the construction and arrangement of the running gear of railroad cars and engines.

To the sixth cross-interrogatory, he saith :

6 X. I am.

To the seventh cross-interrogatory, he saith :

7 X. It is important that cars should have as little friction between the flanges of the wheels and the rails as is consistent with the other duties they have to perform ; but it will not do to sacrifice every other consideration to this. It is equally important that a car should run steadily on the straight track, and be as free as possible from oscillation. To accomplish this, the trucks must not act like a single wheel, by the near coupling of the wheels, as recommended by Winans. I do not think Winans's theory of the near coupling of the wheels would make a car pass round the curves with less friction than they would if the bearing points of the wheels were some fifty-four or fifty-five inches apart.

To the eighth cross-interrogatory, he saith :

8 X. As an abstract proposition, it will.

To the ninth cross-interrogatory, he saith :

9 X. I think not, as indicated in my answer to seventh cross-interrogatory.

To the tenth cross-interrogatory, he saith :

10 X. They will not. Too much freedom of motion in a truck is objectionable on many accounts. Steadiness of motion is of far more importance. By too much freedom of motion the flanges of the wheels are constantly brought in contact with the rails, and the truck has too much wobbling to run steady or safe.

To the eleventh cross-interrogatory, he saith :

11 X. I think I am. My means of knowledge are founded on experience, observation and reading.

To the twelfth cross-interrogatory, he saith :

12 X. The four-wheel cars, as constructed previous to and since Winans's patent, possessed as much steadiness of motion as the trucks of the eight-wheel cars of the present day. There might be more jarring felt by the passengers in the body, than would be in the eight-wheel car, because there was no king-bolt connection through which the jars could be carried off, before touching or affecting the body. It is essential to great steadiness of motion, at high velocities, that the car bodies should be supported at or near their ends, in the same way that the Tredgold, Chapman, Bryant, Allen and Jervis cars (all prior to Winans's patent), were supported.

To the thirteenth cross-interrogatory, the witness saith :

13 X. It is.

To the fourteenth cross-interrogatory, he saith :

14 X. Certainly not. The hind truck in the last car of a train, has too much freedom of motion, and the car does not run as steadily as the other cars in the train, the trucks of which are restrained or

steadied by the draft, to some extent. The flanges of the wheels are constantly brought in contact with the rail, when the truck meets with obstructions, when it has too much freedom of motion, and is constantly bobbing, first against one side and then against the other.

To the fifteenth cross-interrogatory, the witness saith :

15 X. It is not.

To the sixteenth cross-interrogatory, he saith :

16 X. The car represented in the drawing does not correspond with model B, in many essential respects. The bearing surface between the bolsters assimilates more nearly than the wheel-frames, or in the closeness of the wheels in each truck. The bearing surface in model B and in the drawing, is full as great as recommended in the specification.

To the seventeenth cross-interrogatory, the witness saith :

17 X. There is no mode of draft shown in model B, and none whatever mentioned in Winans's specification.

To the eighteenth cross-interrogatory, the witness saith :

18 X. There is a long spring described, fastened to the upper sides of the boxes, which rest on the journals of the axles, by a bolt, or otherwise secured ; and this is all that there is to hold the wheels, or keep the truck from being twisted out of square. No wheel frame is described or recommended ; but the spring is both described and recommended.

To the nineteenth cross-interrogatory, he saith :

19 X. I do, on passenger and freight cars at high rates of speed.

To the twentieth cross-interrogatory, he saith :

20 X. It does represent truly the car described and shown in the drawing accompanying Chapman's specification. The drawing shows a six-wheel car, and the specification on page 139 of the Repertory of Arts says : "If the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equably upon both), and then, similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of a railway."

To the twenty-first cross-interrogatory, he saith :

21 X. There is not ; but in other drawings in the same work, there is a train of cars shown as being drawn from the ends of the body, and in the absence of any other mode being stated, a mechanic would adopt the one shown in other cases.

To the twenty-second cross-interrogatory, he saith :

22 X. There is. On page 95, of Tredgold's treatise, it says, "The body of the waggon rests on the wheel-frames at A, A, and is connected to them by an axis, on which the frames turn, when, from any inequality, the axes of the wheels are not in the same plane."

To the twenty-third cross-interrogatory, he saith :

23 T. Winans says, in his specification, that the object of his car was to run smoothly, evenly and safely ; and to accomplish this, he says, among other things, "I construct two bearing carriages, each with four wheels, which are to sustain the body of the passenger or other car, by placing one of them at or near each end of it." The trucks are swiveling trucks, and thus far correspond with Allen's carriage ; but they differ essentially in the mode of constructing the trucks. The operation of the two, as regards motion, was the same. Their theories were



essentially different ; and experience has shown that Allen's was a practical car, and is now in general use, while Winans's has been condemned. I do not now know of a car, constructed upon his theory, in operation in the United States.

To the twenty-fourth cross-interrogatory, he saith :

24 X. The same answer given to the last question, is applicable to this.

To the twenty-fifth cross-interrogatory, he saith :

25 X. I think he would. The essential principles of an eight-wheel car, to make it perform all the duties required of it, to run smoothly, turn curves, and accommodate itself to all the requisite requirements, were fully developed in cars planned and constructed prior to 1830. No change of principle, only those of proportions, has been necessary to adapt the elemental parts of those cars to general use, as gathered by me from publications.

To the twenty-sixth cross-interrogatory, he saith :

26 X. I do, in connection with the subject now under consideration.

To the twenty-seventh cross-interrogatory, he saith :

27 X. I understand that it was applied to the end of the truck.

To the twenty-eighth cross-interrogatory, he saith :

28 X. I do not ; each mode has its advantages.

To the twenty-ninth cross-interrogatory, he saith :

29 X. They were.

To the thirtieth cross-interrogatory, he saith :

30 X. I cannot now recollect sufficiently to speak with confidence.

To the thirty-first cross-interrogatory, he saith :

31 X. It would not ; for the result is not one that follows a close proximity of the wheels.

To the thirty-second cross-interrogatory, he saith :

32 X. It would not.

To the thirty-third cross-interrogatory, he saith :

33 X. It would not ; nor is it desirable that the trucks should have the greatest possible freedom, "for safety and stability of motion," and with the least practicable friction on the rail.

To the thirty-fourth cross-interrogatory, he saith :

34 X. The description is in the models and drawings themselves. They possessed the requisite principles of construction and organization to run at high rates of speed with safety and ease of motion.

To the thirty-fifth cross-interrogatory, he saith :

35 X. One object of the Chapman, Tredgold, Bryant, and Allen cars was, to carry great weights ; but that was not the sole object. They distributed the weight over a greater surface of the rail, and this, of itself, was an important feature in their design. Messrs. Allen and Bryant both say, their operation was easy to the road ; they run smoothly, and were not subject to the "incessant vibrations" caused by "shocks and concussions," in passing over "those numerous though minute obstructions which unavoidably exist" on railroads. The swiveling motion of the car obviated or overcome these difficulties, as the shocks passed off before reaching the body, to a considerable extent, through the king-bolt.

To the thirty-sixth cross-interrogatory, he saith :

36 X. I cannot say to what purposes all the cars were applied. The

weights carried on some of them might have been subdivided, I have no doubt.

To the thirty-seventh cross-interrogatory, he saith :

37 X. I have not.

To the thirty-eighth cross-interrogatory, he saith :

38 X. I am connected with the Saratoga and Washington Railroad, as Superintendent ; and said company uses the eight-wheel cars.

To the thirty-ninth cross-interrogatory, the witness saith :

39 X. I have not.

To the fortieth cross-interrogatory, the witness saith :

40 X. I am not.

To the forty-first cross-interrogatory, the witness saith :

41 X. I have not.

[Further direct interrogatories, page 659.]

In answer to the further direct interrogatories, on the part of the Respondents, the witness answers as follows :

To the first further interrogatory, he saith :

1. I never knew of his making any objection to the use of the eight-wheel car, nor claiming any pay for its use, until after the commencement of the suit against the Schenectady and Troy Railroad Company.

To the second further interrogatory, he saith :

2. It would not.

To the third further interrogatory, he saith :

3. It would require no invention.

To the fourth further interrogatory, he saith :

4. There is not. It would have precisely the same action if the trucks were much farther apart than they are now represented.

To the fifth further interrogatory, he saith :

5. The answer to this question is given in the last preceding answer.

To the sixth further interrogatory, he saith :

6. There is nothing which requires the wheels to be equidistant apart, under one body. The change of the present short frame to a long body would introduce no new combination or principle of action, and no invention would be required to make the change.

To the eighth further interrogatory, he saith :

8. I understand Winans's theory to be, to connect two pair of wheels in bearing carriages, the wheels in each as close together as they can be without the flanges touching, so as to make them act like a single wheel, and the axles coincide with the radii of the curves, as nearly as possible. The wheels to be connected by a long spring, bolted to the tops of the boxes. A long bolster to extend across the truck, from one side to the other, and fastened each end to the long spring. On top of this another bolster, connected with the body, with a hole through the centre for the king or swiveling-bolt to pass ; these bolsters to be like those of the common road waggon. The trucks to swivel, and the body to turn on the king-bolts. The whole weight of the body to rest on the centre of the bolster, and the trucks to be connected to the body remotely from each other. The theory of the eight-wheel car in general use, is a rigid wheel-frame, one under or near each end of the body, with the bearing points of the wheels about as far apart as the width of the track in each truck. The weight of the body rests on bolsters and side

bearings. Two bolsters are arranged, one to the body, and the other to the truck, through the middle of which the king-bolt passes, allowing the trucks to swivel freely, and the body to turn. The centre of each truck is from five to six feet from the ends of the body. The difference between the theories is essential, and the mode of construction varies materially; but both are intended for the same purpose. One is theory, and the other has been in practice upwards of thirty years. Both, however, are swiveling carriages, and will conform to the different changes of a railroad, and pass curves and switches with ease.

To the ninth further interrogatory, he saith :

9. He recommends a body twice the length of the common four-wheel car. Such a body would be less than thirty feet long.

To the tenth further interrogatory, he saith :

10. It is not essential to the proper and safe construction of an eight-wheel car for rapid travelling, that the trucks should have the greatest possible freedom of swiveling, to conform to the surface of the rails. The car does not run as steady and smoothly when the trucks have too much wobbling or oscillation, as when they are restrained by side bearings, and the draft operating through the king-bolt. To keep the trucks steady, and prevent a too free motion of them, is one advantage in spreading the wheels wider apart than recommended by Winans, in each truck. If any one will get into the hind car of a train, with two or more coupled together, when in motion at a high speed, they will see at once that there is more motion to the hind truck and back end of the car, than is to be found in those forward of it, and restrained to some extent by the weight of the load acting upon the king-bolt.

[Further cross-interrogatories, page 660.]

In answer to the further cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

To the first further cross-interrogatory, he saith :

1 X. I have fully stated it in my answer to the eighth further interrogatory.

To the second further cross-interrogatory, he saith :

2 X. I cannot say.

To the third further cross-interrogatory, he saith :

3 X. The same as now, of materials which require distribution; rather than concentration, of the weight of cars and locomotives.

To the fourth further cross-interrogatory, he saith :

4 X. I cannot say.

To the fifth further cross-interrogatory, he saith :

5 X. Railways were used for the transportation of persons and property, as I have understood, prior to that time; and cars were propelled by both steam and horse power.

To the sixth further cross-interrogatory, he saith :

6 X. I have no definite knowledge on the subject.

To the seventh further cross-interrogatory, he saith :

7 X. I have designed eight-wheel passenger and freight cars, and the running gear to locomotives—in Mississippi, for the Vicksburgh and Jackson road, in about 1836 and '7; and on the Saratoga and Washington road, in 1850, 1851, and '52. J. VAN RENSSELAER.

Subscribed and sworn before me, this December 3, 1853.

JOS. F. SABINE, *Com'r, &c.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 3d day of December, A. D. 1853, Jeremiah Van Rensselaer, of Saratoga Springs, in the county of Saratoga, and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States, within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my rooms in St. Nicholas Hotel, in the city of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me and by my clerk in my presence, before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 17th day of December, A. D. 1853.

JOSEPH F. SABINE, *Com'r.*

#### DEPOSITION OF ALBERT BRIDGES.

[Interrogatories, page 649.]

Albert Bridges, a witness on the part of the Respondent, being duly sworn, in answer to the direct interrogatories, answers as follows:

To the first interrogatory, the witness saith:

1. My name is Albert Bridges; my age is forty-one years; my present place of business is New York. My residence is Jersey City; and my occupation is that of a merchant.

To the second interrogatory, the witness saith:

2. I was educated to the trade of car manufacturing; and formerly carried on that business under the firm of Davenport & Bridges, at Cambridge, Massachusetts.

To the third interrogatory, the witness saith:

3. I am well acquainted with the cars in use on the Eastern Railroad; and am perfectly familiar with the construction and preparation of the cars in use in this country.

To the fourth interrogatory, the witness saith:

4. I have.

To the fifth interrogatory, the witness saith:

5. I have examined model B, and compared it with the provisions of the specification. It justly represents the improvements claimed in the patent. But there is a diversity between the requirements of the written specification and the drawing attached. The model conforms to the former.

To the sixth interrogatory, the witness saith:

6. Presuming the cars on the Eastern Railroad to be the same as those in common use in this country (of which fact I have no personal knowledge) I would reply, that the essential parts are—the body, and the two trucks, and some means of connecting them. These parts are



*essential*, since without them it would be impossible to make an eight-wheel car of the description mentioned. The arrangement of these parts, which I consider essential, is, that the two trucks should be placed under the body, so as to support it properly and give it the greatest ease and evenness of motion. The two trucks should be connected with the body by means of some apparatus which will permit a certain degree of lateral motion around a centre point, to enable the trucks to swivel; and the trucks should be constructed with four-wheels in each, so framed that they should be maintained in their original relative position by the frame, and the bearings of the wheels on the tracks sufficiently separated to enable the truck to run a steady course, and not so far separated as to crowd in passing the curves of the shortest radius. The body of the car should be long enough to give room for the trucks to swivel under it without interfering; and not so long as to become too massive or to vibrate too much when in motion. Many contrivances are added to the elemental and essential parts and arrangements, in modern cars; but they do not incorporate any new elemental principles of organization and arrangement of the running gear or of its connection with the body of the car.

To the seventh interrogatory, the witness saith :

7. As I have said in the last answer, this is so. The construction of the wheel-frames, swinging-bolsters, transom-plates, side bearings, with springs and pedestals, anti-friction Babbett metal bearings; boxes, for excluding dust, and containing a constant supply of oil; apparatus for saving in case of accidents, as check chains, safety-beams and straps, and improved compound brakes, and apparatus for applying them, springs to the buffer and couplings, and so arranged as to overcome, most easily, the momentum and vis enertia of the load; and many other contrivances similar to the above.

To the eighth interrogatory, the witness saith :

8. They are so constructed; the distance is about four-and-a-half feet.

To the ninth interrogatory, the witness saith :

9. Yes, sir. The chief uses of these side bearings are to prevent the car from tipping over on going swiftly round curves, from tilting one way or the other on the straight line, and from jolting by vibration on the springs, and to regulate the freedom of swiveling of the trucks, and to support the body upon as broad a base as possible, and under the strongest part of the frame work, which is at the side.

To the tenth interrogatory, the witness saith :

10. Yes, sir; to prevent the truck from swiveling round too far, in case of accidents.

To the eleventh interrogatory, the witness saith :

11. To both parts of this interrogatory I reply, it does not. This might easily be demonstrated.

To the twelfth interrogatory, the witness saith :

12. Such an arrangement would, in my judgment, be impracticable and unsafe in actual use.

To the thirteenth interrogatory, the witness saith :

13. I have done so : there is a peculiar manner of constructing the trucks, and connecting them with the body, described in the specification. The same peculiarities are not all represented in the drawing,

while other things are there represented differing from those specified. Those differences most obvious are in the modes of construction of the trucks—one showing a regular wheel-frame, and the other none; the different modes of employing and arranging and fastening the springs—the one being safe, the other dangerous and impracticable; in the nearness of position of the wheels, in the upper and lower bolsters, and their connections; in the place and extent of bearings of the one upon the other; in the mode of coupling the cars in the trains; and in various other points, as shown, but not described.

To the fourteenth interrogatory, the witness saith :

14. I have examined them.

To the fifteenth interrogatory, the witness saith :

15. I have examined the model K. It does represent justly the eight-wheel car therein described.

To the sixteenth interrogatory, the witness saith :

16. As respects all that is essential in the manner of arranging and connecting the eight-wheel cars, and the connection of the trucks with the body of the cars, such a mechanic undoubtedly would.

To the seventeenth interrogatory, the witness saith :

17. It has all three.

To the eighteenth interrogatory, the witness saith :

18. I find it nearly so, as far as can be ascertained by measurement on the drawings.

To the nineteenth interrogatory, the witness saith :

19. By changing one of the trucks for a single axle, with two wheels, it may.

To the twentieth interrogatory, the witness saith :

20. I have examined them. I there find a double-truck eight-wheel car shown and described.

To the twenty-first interrogatory, the witness saith :

21. Its component parts are two trucks and one long body, as shown in the drawing of a freight car. Taking the drawing in connection with the book—the cars, when used for passengers, are described as having springs to ameliorate the jolts and jars; so that the trucks, springs, and body are the essential component parts of the passenger cars. The manner in which they are arranged and put together is simply this: the rigid wheel frame holds the four wheels in each truck square and equidistant on the rails. The trucks are connected by a centre bolt or vertical axis, passing down from the body through a ring or thimble, which is attached to the centre of the truck equidistant from the four wheels; this connection (shown in the drawing and required by the conditions of the roads on which it was to be used) permitted the trucks to swivel to the curvatures and irregularities of the road in the same way as the Chapman trucks, which had preceded Tredgold's; but the difference between them is, that the latter has no side bearings.

The place at which the trucks support the body is about the same distance from the end as in common cars, assuming as a standard of measurement, that the wheels were of the ordinary size then used and mentioned in the book. The manner in which the car is calculated to operate is the same as the common car; that is, to swivel to the curves, and conform to all the irregularities of the track; to carry a

great load smoothly along, and to make a proper distribution of weight on the wheels and rails. With the springs (such as belonged to the common four-wheel car) added, it is identical with the common eight-wheel car.

To the twenty-second interrogatory, the witness saith :

22. I have examined the model marked A. It is a correct model ; but model C is not, because it has not swiveling trucks.

To the twenty-third interrogatory, the witness saith :

23. I have compared the eight-wheel car of Tredgold with those in common use, and used on the Eastern Railroad. These and the Tredgold car are evidently calculated to answer the same purposes and object Winans desired to answer ; otherwise he would not have made a car which would answer the purpose : nor would he have stated so particularly the difficulties and peculiarities of structure of the roads he designed his car to travel upon ; nor would he have described the use of springs, floating pistons or their equivalents, for the purpose of attaining ease and steadiness of motion, if he had not *designed* his cars and carriages to attain that object.

To the twenty-fourth interrogatory, the witness saith :

24. I have answered this question in my answer to the last interrogatory.

To the twenty-fifth interrogatory, the witness saith :

25. I have examined the patent of Fairlamb, and saw an eight-wheel double-truck car there shown. It includes all that is essential in the common eight-wheel car. It embraces the very close proximity of the wheels in each truck ; the position of the trucks near each end of the body ; the bearing of the load on centre bearings, extended so as to become a transom plate, and be more safe, without side bearings. So the arrangement of the wheels is the same, and the connection of the trucks with the body is similar, though not the same, as Winans's.

To the twenty-sixth interrogatory, the witness saith :

26. He would, by leaving out what Fairlamb claims as his improvement, and placing the wheels in each truck further apart, and introducing side-bearings. So altered, they would.

To the twenty-seventh interrogatory, the witness saith :

27. I have already examined the model, and stated what I suppose to be a sufficient answer to this question.

To the twenty-eighth interrogatory, the witness saith :

28. I have examined the Bryant model. Its construction and mode of operation are very obvious, and cannot be made clearer to railroad men by any explanation of mine. It is evidently adapted to traverse the curves, inclined planes, and irregularities, and straight track of the road, and to obtain a steady and safe motion. It exhibits the radical elements of all eight-wheel cars, in its parts and combinations, stripped of what is unessential.

To the twenty-ninth interrogatory, the witness saith :

29. I am not certain that I understand what is meant by the "invention described by Winans." The specification describes a certain manner of constructing an eight-wheel car ; the claiming part of the patent does not claim the car, but only a certain manner of arranging the wheels, and a certain way of connecting the trucks to the body. If I am to understand by the words "invention described," the *car*

as described, then the Quincy car contains all that is essential in construction and mode of operation, and all that distinguishes the eight-wheel car from the four-wheel car; which seems to be the object of repeated comparison in the patent itself. If I am to understand by the invention of Winans that which is claimed by him as his invention, then I answer, that the Quincy car does not contain the close proximity of wheels (since the flanges are not as near as may be without touching.) It does not contain the peculiar mode of suspending the whole load upon the centre of the bolster, because it has side bearings. It does not contain one of the peculiarities of supporting the body at its extreme ends, upon the trucks. It does not contain that peculiar mode of uniting the wheels by long springs, which is a remarkable feature of Winans's plan. In these respects, the Quincy car differs from that claimed in the patent, and agrees with those in common use.

To the thirtieth interrogatory, the witness saith :

30. I have no doubt of it.

To the thirty-first interrogatory, the witness saith :

31. I answer this question in the affirmative.

To the thirty-second interrogatory, the witness saith :

32. The distance of the bearing points is just about equal to the distance of the rails apart, in the books which I have examined, and on the cars in general use.

To the thirty-third interrogatory, the witness saith :

33. Springs and pedestals, as now used, were an old invention in 1825; and are described and shown in various old books; Wood, London edition of 1831, shows this; so does Allen's model; they were shown on the drawings made in 1830-1.

To the thirty-fourth interrogatory, the witness saith :

34. They are equivalents; and shown in various books before 1830.

To the thirty-fifth interrogatory, the witness saith :

35. I answer all these questions negatively.

To the thirty-sixth interrogatory, the witness saith :

36. I judge not; increasing the size approximates the flanges.

To the thirty-seventh interrogatory, the witness saith :

37. It is; because the bearing points receive and impart the power that controls the trucks.

To the thirty-eighth interrogatory, the witness saith :

38. It is a fundamental law of construction of trucks, that the axles should be held in bearings that cannot approach or recede from each other; that the axle should remain parallel, and the frame square; otherwise great unnecessary friction will be encountered, and the truck will be in continual danger of mounting the rail.

To the thirty-ninth interrogatory, the witness saith :

39. I don't recollect any at this moment.

To the fortieth interrogatory, the witness saith :

40. As to the practical operation of a car built according to the specification and theory of Winans, I do not see how it could have any practical operation, on account of its peculiar defects of organization. It would be unsafe; and it would not attain any of the beneficial results aimed at by the patentee. By the very near juxtaposition of the wheels in each truck, Mr. Winans designs to avoid unnecessary



friction in passing curves; but the effect would be the reverse, taking the operation of the truck in rapid motion. To effect this the wheels must be put far enough apart to steady the truck. Placing the trucks near the ends of the body is advantageous, and is the mode in the Chapman, Tredgold, Quincy, Allen, and other carriages. I doubt the utility of placing them *at* or *beyond* the ends. By the peculiar connection of the wheels or axles by long springs, the element of flexibility was introduced into the wheel-frame, and an inherent weakness in the structure of the truck that renders it unfit for use at high rates of speed, and altogether unsafe. By the peculiar connection of the body with the truck, by poising the weight upon the centre of the bolster and truck, without extended side bearings, the body would be liable to tip over when passing curves; and if it did not, it would sway to and fro to such a degree as to be unsafe and unpleasant. The risking of the load upon springs without any frame, and the increased danger of rupture by the application of brakes to the wheels, would render such a car altogether too dangerous to be put to any practical use.

I saw, about the year 1840, some trucks, previously built, at Baltimore, under some freight cars. These trucks were like those described in the specification of Mr. Winans, except that they had an apparatus called "saddles," to keep the springs and trucks from twisting on the track, and the springs were placed outside the wheels. The shape of the springs was circular or half elliptic; the bowing part bending upwards, and bolted to the boxes, and the boxes were turned in such a manner that they would twist outwards as the springs were depressed by the weight of the load. The whole load was supported upon the centre of the bolster, and the bearings were not more than five inches wide at the centre; and it had no side bearings. These cars had no brakes; I do not see how a brake could have been adapted to it. Putting on the load would tilt the car over to one side, and any concussion on the rail would lift it over to one side or the other, so as to make it unfit for freight or passengers. I have never seen such a truck upon any passenger car; and I believe it has been abandoned for many years for any purposes. I never saw this or any other similar truck in use on any railroad for many years past; and never saw one at all, except on the Baltimore and Ohio road, as before stated.

[Cross-interrogatories, page 654.]

To the cross-interrogatories propounded on the part of the Plaintiff, this witness answers as follows:

To the first cross-interrogatory, the witness saith:

1 X. I have stated this already in my first and second answers to the direct interrogatories.

To the second cross-interrogatory, the witness saith:

2 X. I have also answered this previously.

To the third cross-interrogatory, the witness saith:

3 X. No, sir.

To the fourth cross-interrogatory, the witness saith:

4 X. I have, to the extent of several years' practice as car-builder, been familiar with machinery, drawings and models; and consider myself competent to make the comparison.

To the fifth cross-interrogatory, the witness saith :

5 X. I have not stated that I was superintendent or employe of a railroad.

To the sixth cross-interrogatory, the witness saith :

6 X. I answer this interrogatory in the affirmative, so far as relates to the construction and operation of railroad cars.

To the seventh cross-interrogatory, the witness saith :

7 X. It is, as well in four as eight-wheel cars.

To the eighth cross-interrogatory, the witness saith :

8 X. It will, in the abstract.

To the ninth cross-interrogatory, the witness saith :

9 X. It will not. There is a medium, proportioned to the degree of curvature. As railroads are constructed in this country, the distance of the wheels apart should be at least about equal to the breadth of the track. I mean, the bearing points and trucks, with the wheels so placed, run much steadier and with less friction, than when placed nearer together.

To the tenth cross-interrogatory, the witness saith :

10 X. They will not. Trucks may have so much freedom as to create such a degree of wobbling as to render the shocks to the body so severe as to make the car unpleasant to ride in. Too much freedom would also produce a great degree of friction of the flanges upon the rails. Trucks should be capable of swiveling sufficiently easy to turn the curves and conform to all the inequalities; but they require something to steady them. Hence a truck with the bearing points of the wheels as far apart as the gauge of the track, runs far steadier than when the wheels are as close together as they can be, without the flanges touching, and assimilating to the action of a single pair of wheels.

To the eleventh cross-interrogatory, the witness saith :

11 X. I am not.

To the twelfth cross-interrogatory, the witness saith :

12 X. It is important to attain the greatest possible steadiness of motion; but it is not my opinion that making the car body of great length, as compared with the modes before practised, and supporting the same at or near its ends, are essential to the attainment of greater steadiness of motion at high velocities, than could be attained by the four-wheel cars, as formerly constructed.

To the thirteenth cross-interrogatory, the witness saith :

13 X. Certainly, if so intended.

To the fourteenth cross-interrogatory, the witness saith :

14 X. I do not consider it essential to the proper working of the forward car in a train, that its trucks should have the same freedom of motion that the trucks in the back cars have. If the draft was a heavy one behind it, there would be some friction on the king-bolt when the trucks first entered or left a curve, as well as on the straight track, when the truck happened from any cause to wobble. The friction last mentioned would tend to keep it steady, and that first mentioned would be so slight and unimportant as not to affect, in any perceptible degree, the power of the truck to conform to the curvatures of the road. The amount of friction upon the king-bolts of a train of cars drawn by the trucks, and not by the body, would be far less than the friction occa-

sioned by the use of side bearings upon a train of cars drawn by the body; because the friction in the latter case is at points so far distant from the centre of motion of the truck. The last truck in a train runs more unsteady than any other, because it has the least to control it.

To the fifteenth cross-interrogatory, the witness saith:

15 X. Clearly not.

To the sixteenth cross-interrogatory, the witness saith:

16 X. It does substantially.

To the seventeenth cross-interrogatory, the witness saith:

17 X. No mode of draft whatever is represented by the model, and none is mentioned in Winans's specification.

To the eighteenth cross-interrogatory, the witness saith:

18 X. It is.

To the nineteenth cross-interrogatory, the witness saith:

19 X. I do consider the use of springs essential to cars intended to carry passengers; but if they are intended for heavy freight, springs may be dispensed with. In the transportation of ordinary freight, they are very desirable.

To the twentieth cross-interrogatory, the witness saith:

20 X. I have answered this question in my answer to the fourteenth direct interrogatory. The draft was applied from the end of the body.

To the twenty-first cross-interrogatory, the witness saith:

21 X. In the drawings and description, in Tredgold's treatise, of an eight-wheel car, no mode of drawing is shown or described; but it is shown in the four-wheel car in other parts of the treatise, to be from the end of the body, and the link may be seen on plate 1st.

To the twenty-second cross-interrogatory, the witness saith:

22 X. There is, on page 179 of Tredgold's treatise, and the drawings on the opposite page, taken in connection with the other parts of the treatise, which show the conditions of roads to which his car was to be adapted, and the objects to be accomplished.

To the twenty-third cross-interrogatory, the witness saith:

23 X. The parts are the two trucks swiveling under one body, with springs and pedestals, side and centre bearings, and adapted to answer the same purposes intended by Winans to be accomplished by his improvements. But it differs from Winans in the same particulars in which he differs from the ordinary eight-wheel cars, viz. the putting the flanges very close together, putting the weight of the load all on the centre of the bolster, and connecting the axles of the wheels by springs, leaving out the truck-frame. The language in which the specification describes the mode of connecting them with the carriage, is as follows: "For this purpose I construct two bearing carriages, each with four wheels, which are to sustain the body of the passenger or other car, by placing one of them at or near each end of it, in a way to be presently described. The two wheels on either side of these carriages are to be placed very near each other; the spaces between their flanges need be no greater than is necessary to prevent their contact with each other. These wheels I connect together by means of a very strong spring—say double the usual strength employed for ordinary cars; the ends of which springs are bolted or otherwise secured to the upper sides of the boxes which rest on the journals of the axles; the longer leaves of

the spring being placed downwards, and surmounted by the shorter leaves. Having thus connected two pair of wheels together, I unite them into a four-wheel bearing carriage, by means of their axles, and a bolster of the proper length extending across between two pairs of wheels, from the centre of one spring to that of the other, and securely fastened to the tops of them. This bolster must be of sufficient strength to bear a load upon its centre of four or five tons. Upon this first bolster I place another of equal strength, and connect the two together by a centre pin or bolt passing down through them, and thus allowing them to swivel or turn upon each other, in the manner of a front bolster of a common road wagon. I prefer making these bolsters of wrought or cast iron; wood, however, may be used. I prepare each of the bearing carriages in precisely the same way. The body of the passenger or other car I make of double the ordinary length of those which run on four wheels, and capable of carrying double their load. This body I place so as to rest its whole weight upon the two upper bolsters of the two before mentioned bearing carriages or running gear. I sometimes place these bolsters so far within the ends of the body as to bring all the wheels under it, and in this case less strength is necessary in the car body than when the bolster is situated at the extreme ends.

To the twenty-fourth cross-interrogatory, the witness saith :

24 X. The parts of the two trucks, and their connection with the body; but there is a difference in the details of the parts, though none that is essential in principle, however different in point of practicability. I should quote the language of the specification, cited in the last answer, as that in which the trucks and their connection with the body are described.

To the twenty-fifth cross-interrogatory, the witness saith :

25 X. I think such a mechanic would, from the knowledge of prior inventions, and of the books on railroads, and his common sense, and the experience which long before that time had led to the construction of cars and carriages which are well adapted to meet these requirements, and do, in fact, embody all that is essential in their construction.

To the twenty-sixth cross-interrogatory, the witness saith :

26 X. I do.

To the twenty-seventh cross-interrogatory, the witness saith :

27 X. To the truck.

To the twenty-eighth cross-interrogatory, the witness saith :

28 X. I do not : each mode has its benefits and drawbacks.

To the twenty-ninth cross-interrogatory, the witness saith :

29 X. They were so in Wood and Strickland, I think.

To the thirtieth cross-interrogatory, the witness saith :

30 X. The draft of the Chapman carriage, and of the Tredgold car, are not represented as applied to the trucks. But the Quincy car is. For my authority I refer to Chapman's patent and Tredgold's work.

To the thirty-first cross-interrogatory, the witness saith :

31 X. Either of these inventions or treatises would have taught a mechanic, in the year 1830, all that experience down to the present day has taught him : that placing the wheels of the trucks very near together would unnecessarily increase, instead of diminishing the friction between the flanges and rails, over curves, and over all other parts of a properly constructed road.



To the thirty-second cross-interrogatory, the witness saith :

32 X. Common sense would, without these prior inventions, have taught any car builder to support his body on trucks near its two ends ; but none of these drawings or descriptions would have taught him that great steadiness of motion would result from great length of the car body ; for this is not the truth, in point of fact. The patent states the true theory in that respect, in saying that the length of the body is not material, if it is supported at the two ends ; and it would have been still more correct if it had said at *or near* the ends.

To the thirty-third cross-interrogatory, the witness saith :

33 X. No, sir : The assumption of this question is erroneous, in fact, as has been proved by practical experience.

To the thirty-fourth cross-interrogatory, the witness saith :

34 X. In the drawings and descriptions inquired of, there are not any allusions to, but full and clear descriptions of the modifications and arrangements of railroad cars, by which they might run at high velocities, such as are used now. And these modifications and arrangements are what contra-distinguish an eight-wheel from a four-wheel car. Yet the four-wheel car is as capable of being run at high velocities, and with as steady motion as any eight-wheel-car, as is shown in experience in England.

To the thirty-fifth cross-interrogatory, the witness saith :

35 X. Not merely that purpose, but also all the other purposes for which eight-wheel cars are adapted and designed.

To the thirty-sixth cross-interrogatory, the witness saith :

36 X. I cannot say for what purpose eight-wheel cars were used prior to 1830, of my own knowledge.

To the thirty-seventh cross-interrogatory, the witness saith :

37 X. I have not.

To the thirty-eighth cross-interrogatory, the witness saith :

38 X. I am not.

To the thirty-ninth cross-interrogatory, the witness saith :

39 X. I have not formed such opinion. If his invention is for the spring which he recommends to unite the wheels in each truck, it is novel and original. But if it is for a swiveling truck with a rigid wheel-frame, connected to the body at or near its end by a king-bolt, either with or without side bearings, it is not new. I never did converse with any one upon the novelty or originality of Winans's invention, prior to an examination of his patent ; nor did I know that he claimed a patent for the eight-wheeled car, until a few years since—after the commencement of the suit against the Schenectady and Troy Railroad for an infringement.

To the fortieth cross-interrogatory, the witness saith :

40 X. I have not stated that I was a railroad superintendent.

To the forty-first cross-interrogatory, the witness saith :

41 X. I have not.

[Further direct interrogatories, page 659.]

To the further direct interrogatories on the part of the Respondents, the witness answers as follows :

To the first interrogatory, the witness saith :

1. We did business for Mr. Winans for *many years*. He was frequently in our establishment. He saw the cars for years, from time to time, built and standing in our shops, and he was perfectly well aware that we were, for years, exclusively engaged in building eight-wheel double-truck cars, such as are in common use in this country. We bought wheels of Winans to put into our eight-wheel cars, which he well knew of, and we often talked about the eight-wheel cars and matters relating to railroads ; and, during all this time, Mr. Winans never intimated that these eight-wheel cars, or any of the cars in use, were infringements upon any patent ; nor did I ever know, until about 1848, that there was any such patent ; nor did Winans ever ask any adjustment, or say directly or indirectly, or intimate in any way that he had any claim to or on account of the eight-wheel car ; and I was not a little astonished to hear that he had commenced a suit for a patent on the eight-wheel car.

To the second interrogatory, the witness saith :

2. Lengthening the body, under these circumstances, would not.

To the third interrogatory, the witness saith :

3. It would not.

To the fourth interrogatory, the witness saith :

4. To both branches of the question I answer no.

To the fifth interrogatory, the witness saith :

5. I repeat the same answer.

To the sixth interrogatory, the witness saith :

6. I answer in the same way.

To the seventh interrogatory, the witness saith :

7. Both parts of this question I answer in the negative.

To the eighth interrogatory, the witness saith :

8. There is a clear difference between these theories ; and that difference is not one of detail, but affects the practical utility of the two cars.

To the ninth interrogatory, the witness answers :

9. It is not.

To the tenth interrogatory, the witness saith :

10. It is clearly not. Nothing would be more dangerous.

[Further cross-interrogatories, page 660.]

To the further cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

To the first cross-interrogatory, the witness saith :

1 X. 1st, The very close proximity of wheels in each truck, so as to make the two wheels as nearly as possible resemble the action of a single wheel, and to cause the axles of the wheels more nearly to coincide with the radii of the curves, with the idea of thereby reducing the friction of the flanges against the rails.

2d, The connection of the wheels in each truck by a spring instead of rigid wheel-frames, with a view by this arrangement of four-wheels to increase the safety of the car over those running on four-wheels only ; and the bearing of the weight of the body upon the centre of the bolster, avoiding side bearings, with a view of producing increased ease and steadiness of motion. These theories I have in mind in answering the question referred to.

To the second cross-interrogatory, the witness saith :

2 X. There was no speed that could be called an average rate. Railways were principally used for freight.

To the third cross-interrogatory, the witness saith :

3 X. I have never yet heard or known of any railways in which concentration of the weight of cars or locomotives was either required or admissible.

To the fourth cross-interrogatory, the witness saith :

4 X. I have always supposed there were ; the Stockton and Darlington, and the Liverpool and Manchester.

To the fifth cross-interrogatory, the witness saith :

5 X. It was generally so ; but on some roads locomotives had been introduced successfully.

To the sixth cross-interrogatory, the witness saith :

6 X. I cannot tell.

To the seventh cross-interrogatory, the witness saith :

7 X. I have built and designed cars—both four-wheel and eight-wheel cars. I was engaged as co-partner with Mr. Davenport, under the firm of Davenport & Bridges, in Massachusetts, in the year 1837. Previously to that he had been making four-wheel cars. We designed and built eight-wheel cars, in 1837 or 1838, for the Worcester Railroad. It is my impression that these eight-wheel cars were built previously to those first built upon the Providence road ; and I am certain that these were built previously to those which were constructed at Attleborough, by Jeremiah Meyers. Mr. Peter Clark came to us, sometime after we had built these eight-wheel cars for the Worcester road, and said that he had concluded to have some eight-wheel cars built, and desired to give us the job. We made a proposal of the price at which we would build them for Mr. Clark ; but Mr. Meyers afterwards offered to Mr. Clark to build these cars for about two hundred dollars each, less than the sum at which we had proposed, and in consequence of this Mr. Clark gave Meyers the contract, and he afterwards went on to build them. Unfortunately he failed in business as soon as the contract was completed.

In building our eight-wheel cars we had no model or pattern whatever ; we had no difficulty in building them. Neither my partner nor myself knew of Mr. Winans's patent being in existence ; nor did I hear of it until about ten or eleven years afterwards.

In building these eight-wheel cars, they were constructed substantially the same as they now are. But I do not employ such trucks as Winans describes ; they were trucks with solid square wheel-frames ; the wheels in each truck were near together, but not quite so near as Winans's. The draft was by the front part of the truck. Of this first set of cars there was only one or two, and they were placed on the Worcester road ; and they were used till they were worn out on that road.

ALBERT BRIDGES.

Subscribed and sworn before me, this November 10, 1853.

JOS. F. SABINE, *Commr. &c.*

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

On this 9th and 10th days of November, A. D. 1853, Albert Bridges, of Jersey City, in the State of New Jersey, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my rooms in St. Nicholas Hotel, in the city of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of the said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 16th day of December, A. D. 1853.

JOSEPH F. SABINE, *Com'r.*

## DEPOSITION OF WILLIAM J. McALPINE.

William J. McAlpine, a witness on the part of the Respondents, being duly sworn, in answer to the interrogatories of the Respondents, saith :

[Interrogatories on page 649.]

To the first interrogatory, the witness saith :

1. My name is William J. McAlpine; my age is 43 years; my place of business in Albany and New York; my profession is that of civil engineer.

To the second interrogatory, the witness saith :

2. I have been engaged as civil engineer through a period of about twenty-eight years. I have been engaged in the Carbondale Railroad, the Mohawk and Hudson, the Schenectady and Saratoga, and the New York and Erie; also on the St. Lawrence improvement, the Chenango Canal, and on the Erie Canal enlargement. I was engineer of the United States Dry Dock, at Brooklyn; was engineer under Chancellor Walworth, in the Wheeling Bridge case, referred to him by the Supreme Court of the United States; and afterwards was appointed by the Court to examine and report engineering facts in the case. I was engineer of the Albany, and also of the Chicago Water Works. I am now the State Engineer and Surveyor of the State of New York. I am perfectly familiar with the principles and operation of the eight wheeled cars now in general use, both theoretically and practically.

To the third interrogatory, the witness saith :

3. I am, thoroughly.

To the fourth interrogatory, the witness saith :

4. I have examined the specification of Ross Winans's patent, of Oct. 1, 1834, for an alleged improvement in cars or carriages intended to run on railroads, and understand the same.

To the fifth interrogatory, the witness saith :

5. I have examined the model B, and compared it with the specifi-



cation, and find it to be correct in all of its parts. It is just such a car as I should construct with the specification as a guide.

To the sixth interrogatory, the witness saith :

6. The parts of the eight-wheel double-truck car which I consider essential, are two solid rigid trucks, and a frame or body resting upon bolsters. It should be arranged or organized by placing the two trucks as near to the ends of the body as they can consistently be, without coming in contact with other trucks under bodies running in the same train, resting upon a bolster, with a king-bolt in the centre, and side bearings, to allow the trucks to swivel freely, and conform themselves to all the curvatures and other irregularities of the road, and at the same time move smoothly and steadily on the track, without too much oscillation. The wheels in each truck should be about as wide apart as the width of the track, from bearing point to bearing point. If the road upon which the car is intended to run has light curvatures, the motion of the truck will be steadier, if the wheels are wider apart between the bearing points, than the width of the track ; and they will move with less oscillation than when brought "very near to each other."

To the seventh interrogatory, the witness saith :

7. They have various, and all of them more or less important, in making the eight-wheel cars now in general use what they are—an article well adapted to the purposes for which they are used ; easy, safe, comfortable to passengers who are transported in them. Among the improvements not named in Winans's specification are, side bearings, swinging bolsters, draw or coupling springs, safety beams, to prevent the ends of the axle from dropping, if it should break ; improved brakes, of a variety of construction ; boxes of various kinds, pedestals and springs.

To the eighth interrogatory, the witness saith :

8. They are from five to seven feet.

To the ninth interrogatory, the witness saith :

9. They do ; and it is essential that they should, to keep the body from swinging or tipping from one side to the other, when the car is in motion, in passing curves, and when the load is not evenly adjusted on each side. If the centre body of the car was borne on the king-bolt, "in the manner of the front bolster of a common road waggon," it would not be safe to run at a rate of speed of twenty-five miles per hour, loaded as cars usually are with passengers, in consequence of the rocking that would take place. Side bearings, also, keep the trucks more steady when in motion than they could be if all the bearing was in the centre on the king-bolt.

To the tenth interrogatory, the witness saith :

10. Check chains are frequently used for the purpose of preventing too much rocking of the body, and the trucks from turning round sideways when the car gets off the track.

To the eleventh interrogatory, the witness saith :

11. Increasing the length of the body does not introduce any new principle of mechanism. The same faculties that could construct a car body twenty feet long, would be able to build one seventy feet, without exercising any inventive powers.

To the twelfth interrogatory, the witness saith :

12. Connecting the wheels of a truck by long springs made strong,

"say, double the usual strength employed for ordinary cars," "the ends of which are bolted or otherwise secured to the upper sides of the boxes, which rest on the journal of the axles," will not answer in practice. Trucks so constructed would be too elastic for safety, as they would not be able to resist the numerous and severe shocks they have to encounter, without being thrown from the track. The sudden application of the brakes to the wheels, when the car was at a high rate of speed, would be very likely to break the springs near the ends of them in their weakest points; and if the springs did not break, the trucks would be very likely to be twisted out of square, and the wheels placed in a condition which would incline them to ride or get on the rails, and throw the whole car off the track. I consider it indispensable that a truck should be rigid, and the axles perfectly parallel to each other, to run safely and smoothly and evenly on the road.

To the thirteenth interrogatory, the witness saith:

13. It does not. It is very different in several important respects. The drawing has a rigid truck-frame of wood, which holds the wheels rigidly in their place, and the specification does not describe such a truck. The centre bearing is much wider, which would keep the body more steady when the car is in motion. It represents a freight, instead of a passenger car, which Winans speaks of. Two springs are on each side of the truck in the freight car, while the specification recommends but one, which is used to connect the axles in the truck, and the springs are represented with their shorter leaves downward, while the specification directs the longest to be at the bottom. The trucks are not placed as near the end of the body as required by Winans, nor are the wheels put as closely together as they can be without the flanges coming in contact with each other. They are far enough apart to admit a brake. The drawing shows the mode of drawing the car, from the end of the body, while the specification does not mention any mode of draft. The drawing also differs from the specification in having pockets for the ends of the springs to work in, instead of being bolted.

To the fourteenth interrogatory, the witness saith:

14. I have.

To the fifteenth interrogatory, the witness saith:

15. The model marked K, which I have examined, does truly represent a car described in Chapman's specification, patented in London, in 1814, which describes a six-wheel carriage having a regular four-wheel frame, with a centre pivot and side bearings under one end, and a pair of wheels under the other end of the body. It is ascertained by measurement of the plan of this four-wheel truck or wheel-frame of four wheels, in Fig. VIII, Plate V, that the distance of the bearing points of its wheels apart is about equal to the breadth of the track; and the specification describes that the carriage body may be supported by two of these four-wheel frames, both alike, laying the weight equally upon both, and they turn by means of their centre pivots or axes, to suit the curves and other inequalities of the roads. In that description and drawing of Chapman, we have the essential principle of construction and operation, both in detail and organization, of the eight-wheel car now used. There is the rigid rectangular wheel-frame of four wheels, with the cross piece, centre pivot, and side bearings; and the bearing points of the wheels, whether larger or small-

er wheels may be used, given a distance apart about the same as the breadth of the track, and the carriage body sustained by the two bearing carriages, laying the weight equally; being the same essential principles of construction as used at present in the eight-wheel cars.

To the sixteenth interrogatory, the witness saith:

16. He would, most certainly.

To the sixteenth interrogatory, the witness saith:

17. It has, as I have described in my answer to the fifteenth interrogatory.

To the eighteenth interrogatory, the witness saith:

18. It is, as described in my answer to the fifteenth interrogatory.

To the nineteenth interrogatory, the witness saith:

19. It may, by making the proper change in one of the trucks.

To the twentieth interrogatory, the witness saith:

20. I have; and find the drawings and description of a double-truck eight-wheel railroad car.

To the twenty-first interrogatory, the witness saith:

21. The Tredgold car has two four-wheel trucks, and each four wheels united by a strong rigid frame, being united to the body by a king-bolt and bearing in the centre of the truck, which allows it to swivel and conform to all the curves and sinuosities of a railroad. The trucks are placed a sufficient distance from the ends of the body to prevent their interfering with each other when several cars are run in a train. The distance of the bearing points of the wheels from each other is about equal to the width of the tracks of our common railroads. The description and drawing both show and describe a swiveling truck, one that will conform to all the changes of level. It is not only calculated to divide the pressure upon the wheels, but to run smoothly and safely upon the track.

To the twenty-second interrogatory, the witness saith:

22. I have examined the model marked A, and believe it to be a correct representation of the car represented in Tredgold's work, on page 179, plate IV, fig. 26. The mode of draft on the model is not shown in the drawing, but is represented in other parts of the work. It is the only mode of draft shown in the work. I have examined model C, but it is not a correct representation of the car shown in Tredgold's work, or any described by him. He describes a car of eight-wheels, to support one body, which rests upon "the wheel-frame of each set of four-wheels, in the middle of its length, and is connected with those frames so as to allow the greatest possible change of level." The car C would not conform to curves or any lateral changes in the road, and would not answer to run upon any railroad.

To the twenty-third interrogatory, the witness saith:

23. The Tredgold eight-wheel car is such; substantially the same, in the mechanical principles and mode of operation, as those used on the various railroads in this country, so far as the running gear is concerned, with the exception of side bearings, which are now used in all cars.

To the twenty-fourth interrogatory, the witness saith:

24. I have stated, in a previous answer, that Tredgold's car was calculated to swivel and conform to all the irregularities of a railroad; and

I consider that it will answer all the purposes and objects set forth in Winans's specification.

To the twenty-fifth interrogatory, the witness saith :

25. I have seen and examined a copy of Fairlamb's patent. In one of the drawings an eight-wheel car is shown, with two swiveling trucks, one near each end of the body, with the wheels in each truck near together, as recommended by Winans. The axles are not held by a spring, but by a solid frame of wood, and the body rests upon a centre or transom plate. The axles in one of these trucks embody Fairlamb's improvement ; the other is similar to the common truck now in use. The axles in one truck are allowed to slide, by a spreading apart on one side and sliding nearer together on the other, in passing curves. The drawing shows a car substantially like that claimed by Winans's patent, with the exception that Fairlamb's truck, as shown in the drawing, is made of wood, and the wheels are held in the truck-frame instead of being coupled or held by springs.

To the twenty-sixth interrogatory, the witness saith :

26. A mechanic of ordinary skill in car building, with Fairlamb's patent and drawings before him, would be enabled to construct an eight-wheel car like those now in common use on the roads of the United States, by omitting Fairlamb's improvements, and spreading the wheels, without exercising inventive powers ; and when so constructed, it would embody the essential principles of the eight-wheel railroad cars in common use ; and it would embrace all the beneficial results pretended to be obtained by said Winans's patent.

To the twenty-seventh interrogatory, the witness saith :

27. I have examined the model and drawings of the Allen steam carriage ; and the mechanical principles of its construction and combination are precisely the same as those of the eight-wheel cars now in common use, and it will perform all the beneficial results stated and claimed to be accomplished in Winans's specification of Oct. 1, 1834. It has the rigid square truck-frame, to hold the axles firmly in their positions, with the body connected to the trucks by a king or centre-bolt, upon which the trucks turn, to conform to all the curvatures or irregularities of the road. It has also side bearings to hold the body steady and prevent its rocking. It has, also, pedestals and springs, all of which are now in common use upon the eight-wheel cars generally used on the railroads of the United States. A mechanic of ordinary skill would be able to construct the cars now in general use with Allen's steam carriage and drawings before him, without exercising any inventive powers. The putting of smaller wheels, or those of the size of the ones in the forward end of each truck, in the place of the large driving wheels, or the placing of a body upon the trucks, instead of the boilers, as represented in the model, would involve no invention. It would only be a change of proportions. I should judge, from the appearance of the model, that the car or carriage must have run very steadily and smoothly on the track, and avoided the severe "shocks occasioned by the percussion of the wheels on protuberant parts of the rails or other objects," which were common to the short or four-wheel trucks.

To the twenty-eighth interrogatory, the witness saith :

28. I have examined the model of the eight-wheel double-truck, marked "G. Bryant." It has the rigid square wooden truck, with the



axles held firm in their place, and one truck under each end of the frame or body; and its operation allowed it to swivel or turn in passing the curves or the irregularities of a railroad. It is operated upon the same mechanical principles as the cars used on all the railroads of the United States.

To the twenty-ninth interrogatory, the witness saith :

29. The Quincy or Bryant car embodies all the essential principles that are contained in Winans's patent. The only essential difference between them is, that the Quincy cars have side bearings, and a rigid wheel-frame to hold the axles parallel and firm in their place; while in Winans's, the load of the body rests on the centre of the bolster at the king-bolt without side bearings, and the wheels and axles in each truck are connected by an elastic spring. It possesses all the advantages claimed by Winans, while it avoids his defects, which are prominent; so much so, indeed, as to render a car constructed after his specification unfit to run on a railroad with safety. The Quincy car will not only distribute the weight among the wheels, but it will run smoothly and steadily on the track. No invention would be required to substitute a long body, in which passengers could be properly transported, for the heavy and somewhat clumsy frame now shown upon it.

To the thirtieth interrogatory, the witness saith :

30. A mechanic of ordinary skill and knowledge of railroad cars, would have not the least difficulty in constructing eight-wheel cars, as now in general use in the United States, with the Quincy car before him; nor would it require the exercise of invention of his own to do so, "so far as regards the arrangement of the wheels and the connection of the trucks with the body of the cars."

To the thirty-first interrogatory, the witness saith :

31. I have seen and examined said treatises, except that of Strickland. The mode of drawing railroad cars prior to 1830, was by the middle of the end of the body, as shown in the works referred to.

To the thirty-second interrogatory, the witness saith :

32. I have examined the last mentioned printed works, and find the distance of the bearing points of the wheels are about the same width as the gauge of the track, which is the distance generally adopted throughout the United States.

To the thirty-third interrogatory, the witness saith :

33. They were shown very distinctly in Wood's treatise, and in said Allen's model and drawings.

To the thirty-fourth interrogatory, the witness saith :

34. Both modes were well known and shown in public works, prior to 1830, and were equivalents for each other.

To the thirty-fifth interrogatory, the witness saith :

35. These changes would not introduce any new mode of operation or construction in the Bryant car; nor would invention be required to make any or all of the changes spoken of.

To the thirty-sixth interrogatory, the witness saith :

36. The distance of the flanges from each other, in the double-truck eight-wheel railroad car, is not material; for the size of the wheels may be changed; but the distance between the bearing points of the wheels is material, for upon that depends the steadiness of the trucks, and consequently the safety and ease of motion of the body of the car.

The steadier the truck is moved, the more ease is gained to the load. The shocks to the body are much less when the bearing points of the wheels are as far or farther apart than the width or gauge of the track, than they would be if "placed as close together as they could be without the flanges touching."

To the thirty-seventh interrogatory, the witness saith :

37. I have fully answered this interrogatory in the previous answer.

To the thirty-eighth interrogatory, the witness saith :

38. It is material and necessary that the axles of the wheels in each truck should be kept at a fixed distance from each other; and they should be held firmly in their place; for as soon as the trucks or axles are wrenched out of square, as they are very likely to be by use, if not firmly fixed, they are crowding the rails, and much more likely to be thrown from or hop off the track. A spring or elastic truck, as I have remarked in one of my preceding answers, such as recommended by Winans in his specification, is not practical or safe.

To the thirty-ninth interrogatory, the witness saith :

39. I do not.

To the fortieth interrogatory, the witness saith :

40. The theory and arrangement of the eight-wheel cars are not sound or practical. Trucks built in the manner recommended in the patent, would be subject to many and fatal objections. I cannot believe that a truck thus constructed and put to use, would run upon any railroad at the ordinary rates of passenger travel, without disastrous consequences. The trucks would not stand the shock and pressure to which they would be subjected, without the addition of other parts to the trucks, which would render them entirely different in their construction, and in the action and relation of their parts to each other, from that described in the specification. I am aware that in one passage of the specification, the patentee says, "the benefits of his invention may be derived from the substitution of ordinary four-wheel bearing carriages, provided the wheels are very close together; but even this substitute would be fatally defective, because the weight being borne on the centre, without side bearings to steady the truck and body, it would produce great unnecessary friction, unsteadiness of motion in the truck and the body, and be in constant danger of jumping off the track.

For several years, in the earlier part of my life, I was personally employed in my father's machine shop, in the construction of various descriptions of machinery, including the building of cars and other railroad work. I have since been engaged in planning a great variety of machinery for public and private works, for many years. I consider myself perfectly familiar, practically and theoretically, with the principles of construction and operation of machinery.

[Cross-interrogatories, page 654.]

To the cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

To the first cross-interrogatory, the witness saith :

1 X. I refer to my former answer to the direct interrogatories, as a sufficient reply to the inquiry.

To the second cross-interrogatory, the witness saith :

2 X. I have, in the way and manner stated in my direct examination.

To the third cross-interrogatory, the witness saith :

3 X. I have not. This is the first time I have been examined as a witness in a patent case :

To the fourth cross-interrogatory, the witness saith :

4 X. I have been so accustomed for many years, and to a great extent.

To the fifth cross-interrogatory, the witness saith :

5 X. It has, as before stated.

To the sixth cross-interrogatory, the witness saith :

6 X. I answer this interrogatory in the affirmative.

To the seventh cross-interrogatory, the witness saith :

7 X. If by the "least possible friction," is meant the least friction one can get along with, and at the same time make a car of the construction and proportions called for by due regard to all the emergency to which it is to be adapted, I should answer the question affirmatively. But in building a car properly, regard must be paid, in the first place, to safety; then to ease and convenience of travellers, and then to the avoidance of all unnecessary loss of motive power; and the friction between the flanges and rails is one of the elements which should not be lost sight of; but one should not sacrifice every other important feature of a well-constructed car, to the diminution of that friction, but should avoid it as far as he can, without sacrificing more important things.

To the eighth cross-interrogatory, the witness saith :

8 X. Yes sir, it will.

To the ninth cross-interrogatory, the witness saith :

9 X. No, sir, it will not, as any practical railroad man will easily see, by trying the experiment.

To the tenth cross-interrogatory, the witness saith :

10 X. No, sir; experience has shown the contrary to be the case.

To the eleventh cross-interrogatory, the witness saith :

11 X. I think myself so. My means of knowledge are—books on the subject of railroads; daily experience in my business, and constant intimacy with others engaged in the same business with myself.

To the twelfth cross-interrogatory, the witness saith :

12 X. The greatest steadiness of motion that can be attained, consistent with a due regard to propriety in the construction of the different parts of the car, is a most desirable characteristic of all cars. I do not think that making the car body of great length, as compared with the mode before practised, is essential to the attainment of greater steadiness of motion at high velocities, than could be attained by four-wheel cars, as formerly constructed.

To the thirteenth cross-interrogatory, the witness saith :

13 X. As cars are now ordinarily used, it is.

To the fourteenth cross-interrogatory, the witness saith :

14 X. It is not. The last truck in a train has most freedom of motion, as cars are now usually drawn; and it is the most unsteady truck in the whole train. It has too much freedom of motion. If the first truck had as much freedom it would act just as badly.

To the fifteenth cross-interrogatory, the witness saith :

15 X. It is not. Some of the best cars in the country have been drawn by the truck, and most are now drawn by the king-bolt.

To the sixteenth cross-interrogatory, the witness saith :

16 X. I see no reason for doubting it. The bearing surface is nearer the centre, but about the same in extent.

To the seventeenth cross-interrogatory, the witness saith :

17 X. It does not.

To the eighteenth cross-interrogatory, the witness saith :

18 X. Yes, sir. The mode of constructing the truck, by using axles and springs, instead of a frame, is described as essential as any part of the patent, as I understand it; for after having described the manner of arranging and connecting the wheels, in two bearing carriages, he goes on to describe the manner of connecting the trucks with the body; and then, in the claiming part of his patent, he claims "*the before described manner of arranging and connecting the eight wheels, (which constitute the two bearing carriages) with a railroad car.*" As there is but one manner of arranging the eight wheels, and one manner of connecting the trucks with the body, described in the patent, I suppose that the manner of connecting the eight-wheels with each other in two bearing carriages with springs, to be as essential as any of the other peculiarities described in the patent. In the last paragraph but one, in the specification, it states that the end the patentee has in view "May be obtained by constructing the bearing carriages in any of the modes usually practised, provided that the fore and hind wheels of each of them be placed very near together;" and he gives as a *reason*, that the proximity of the wheels is a most important feature of his invention. He does not describe how this ordinary bearing carriage is constructed; how it is connected with the body of the car, whether by the addition of bolsters or in what manner it is to be done, while the whole arrangement of the spring truck is fully described; and as the ordinary bearing carriage was stated in the specification to be in common use, I do not suppose the patentee intended to claim that as any part of or as any peculiarity in his invention, but only to suggest what he considered might be a substitute, by which one of the features of his invention might be attained, viz. the *nearness of the wheels*, in each truck. I do not suppose that Mr. Winans intended to claim merely the bringing the wheels of his truck nearer than what was usual in the four-wheel cars; but the doing this in the *manner* described, or what would be equivalent to it; therefore I have formed the opinion that the spring connection of the axles is an essential feature of the invention, as described and claimed by him.

To the nineteenth cross-interrogatory, the witness saith :

19 X. When ease of motion is required, springs or some substitute for them are proper.

To the twentieth cross-interrogatory, the witness saith :

20 X. Chapman's drawing represents a four-wheel car and a six-wheel car, and a truck or transom under one end; and the specification directs the use of two trucks or transoms under one body, if the length of it be increased. It was a car or carriage, or freight waggon. I see no impropriety in calling it a car, although the six and eight-wheel car has no body, but only a plain platform, which is so drawn as to show



the running gear and its connection with the body. In order to make it the same thing as a common railroad freight or passenger car, you would set a body or box on that platform. Model K would be a more exact representation of the body of the four-wheel cars, if the box was taller; it would more resemble the eight-wheel car if the box was removed and a platform only were substituted; but there is not the least importance in following out resemblances in such unimportant particulars, according to my views.

To the twenty-first cross-interrogatory, the witness saith :

21 X. Not in the eight-wheel cars; but this is found in all the cars which are drawn, as described, in trains.

To the twenty-second cross-interrogatory, the witness saith :

22 X. There is such a description in the drawing of the eight-wheel car and the description on page 179.

To the twenty-third cross-interrogatory, the witness saith :

23 X. The language in Winans's patent, in which the parts of his invention are described, begins with the passage, "For this purpose I construct two bearing carriages," and ends with "Another advantage of this car." In these passages is contained a description of two trucks, and their mode of connection with one body. The general principles of their construction and operation, as I have before stated, are all embodied in the Allen steam carriage. The differences between them are in details, some of which are important to the proper construction of the car; one is the use of side bearings; a second is that of spring pedestals; a third is that of wheel-frames; a fourth is the position of wheels, which are not as near as may be without the flanges touching. The modern eight-wheel cars are like Allen, in these respects, and unlike Winans.

To the twenty-fourth cross-interrogatory, the witness saith :

24 X. In regard to the parts of the patent which contain the description of the Quincy car, I should quote the same passages before cited. But I should also add that, while the Quincy car embraces substantially the same parts, and in substantially the same combination with each other, yet there is a difference in the details of their structure: 1st. In the distance of the wheels in each truck. 2nd. In the use of a rigid wheel-frame, instead of an elastic one. 3rd. In the use of side bearings; and in these respects the cars in common use are like the Quincy, and unlike the Winans cars.

To the twenty-fifth cross-interrogatory, the witness saith :

25 X. I see no reason why he should not have known it. Experience would have taught a car builder, in 1829 or 1830, that the characteristics and requirements of a railroad passenger car would be—strength, durability, safety and ease of motion, and the transportation of the largest loads with the least waste of tractive power, and the least wear and tear of rails and machinery. All these requirements and characteristics have been more and more completely answered, from year to year, both in four-wheel and eight-wheel passenger cars; and will, I presume, continue to be still further developed.

The treatises of Wood and Tredgold and other scientific works, had been written; Chapman's patent had been granted; and for many years railroads had been in use in England, which, though mostly used for transit at slow rates, were not so universally; and these had

assisted in turning attention to the subject of the capacity and requirements of railroads. And as cars had travelled at the rate of fifteen miles per hour, and one locomotive at the rate of thirty miles previously to 1830—fall of 1829—it is obvious that enough was known of the action of railroad cars, to have fully developed the laws of physical philosophy which are involved in the running of cars at rapid rates; specially as no new laws are developed by increasing the rates of speed.

But there are some of the requirements and characteristics of a railroad car necessary to enable it to move safely and smoothly at the rate of thirty miles per hour, which have not yet been embodied in any form by which those characteristics can be fully answered. These requirements have long been known, but it must be left to future invention to contrive the ways and means for accomplishing these objects.

To the twenty-sixth cross-interrogatory, the witness saith:

26 X. I do, though each mode has advantages of its own.

To the twenty-seventh cross-interrogatory, the witness saith:

27 X. To the truck (it is said) at the front part of the framing.

To the twenty-eighth cross-interrogatory, the witness saith:

28 X. Not wholly so.

To the twenty-ninth cross-interrogatory, the witness saith:

29 X. As to Wood, I answer in the affirmative. All the cars in the plates of Tredgold, where the draft is shown, are four-wheel cars, with the wheels attached to the body; but there being no other mode of draft shown on the plates, or in the treatise, or known in use in England, so far as I know, except the draft by the body, I consider that the effect is the same as though the sketch of an eight-wheel car, in Tredgold, had been completed, and the mode of draft by the body added.

To the thirtieth cross-interrogatory, the witness saith:

30 X. Upon the same reasons stated in my last answer, applied to Tredgold's patent, I reply, that Chapman's and Tredgold's are two instances to the contrary. For I cannot consider that, when the different parts of a machine are represented on the same plate, it can be necessary to repeat those parts in every plate where the machine is represented, in order to give a mechanic of ordinary capacity the means of understanding the design of the author. I cannot see how it was necessary, in Chapman's patent, to represent, on figure 8, what had been already shown in figure 1; nor in Tredgold, on plate 4, what had been so frequently represented on preceding plates.

To the thirty-first cross-interrogatory, the witness saith:

31 X. I think these prior inventions would have taught a mechanic, in the year 1830, to put his wheels just about as far apart as they are now placed in the ordinary eight-wheel cars; and that that position would, on the whole, be the best. It is a misapprehension of the facts to suppose that friction between flanges and rails is reduced by bringing the wheels very near together.

To the thirty-second cross-interrogatory, the witness saith:

32 X. Great length of body is not essential to attaining great steadiness of motion. That arises from many different causes.

To the thirty-third cross-interrogatory, the witness saith:

33 X. The trucks should not have the greatest possible freedom to conform to the surface of the rails, in order to move with the greatest safety and steadiness, and with the least practicable friction.

To the thirty-fourth cross-interrogatory, the witness saith :

34 X. The drawings and description show and describe the arrangements and modifications of the eight-wheel cars, as well as the four-wheel cars, by which both these results have been attained in practice, both in England and the United States.

To the thirty-fifth cross-interrogatory, the witness saith :

35 X. No, sir : that is not the only object for which eight-wheel cars and carriages were made. The Chapman carriage had two objects ; one to divide the weight, and the other was to employ two swiveling trucks for the same purpose they are now employed. One of the designs is distinctly expressed on page 130 of the patent. " We also, as the carriage containing the motive power will, thus loaded, be too heavy, in various cases, for the strength of the existing iron or wooden rails, if resting on four wheels only, so arrange it for such ways or other confined ways, when the ledges (flanges) either of the ways (track) or wheels, regulate the direction of the carriage, that it may rest equably and move more freely round the curves or angles, either on six or eight wheels, so as to reduce its pressure on each, in the inverse proportion of its number of wheels."

And on page 139, the patent says, " And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute in place of the axes, a transom or swiveling truck, (such as described) laying the weight equally on both ; and then similarly to two coal waggons attached together, the whole four pairs of wheels will arrange themselves to the curves of the railway."

The patent describes how the power of draft is to be applied ; as being by a chain or knotted rope in which the point at which the draft is received by the car is at the small pullies at the front or rear end, or at any intermediate point between the two ; being in all cases in a line between the middle of the two ends of the body, and precisely equivalent to a draft attached to the platform or body of the car. The patentees describe their car, thus moved, as being capable of carrying a steam engine or any other means of locomotion. So that the structure described is not properly called a locomotive in any other sense than a common eight-wheel car should be called a locomotive, supposing it contained a windlass on either platform, or in the middle of the body, by which the conductor might wind up a rope fastened at one end to a point between the rails, and whereby he should move the car forward. There was no connection between the machinery for locomotion (if such machinery were introduced) and the wheels of the car. There were no driving wheels, and nothing to interfere in any way with the ordinary action of the trucks, in swiveling and conforming to the curves and irregularities of the road : and under these circumstances I can see no impropriety in calling the Chapman carriage a car ; for it embraces all that is essential in the modern eight-wheel car, besides being in fact drawn by the body ; and nothing is clearer than that the patentees designed these double-truck swiveling cars for the purpose of conforming to the curvatures and irregularities of the railroads, and equalization of the pressure on each wheel, or (to use his words) " that it, the waggon, may rest equably ;" and these objects are as prominent as the introduction of eight wheels, so as not to overload any one wheel, or place too much weight on one point of the road at one time.



As to Tredgold, so far as relates to this question, I make the same answer. His car I considered as substantially the same as Chapman's, differing from it only in the absence of side bearings. The purposes for which the Tredgold car was introduced were not only to carry great weights, and divide the weight equally on each wheel, but particularly to enable the car to traverse and conform to all the curves and irregularities of the roads, to avoid unnecessary friction, and to carry the load, when of passengers, smoothly. I refer to the following passages: more particularly as to the avoidance of friction, to pages 42, 43, where he describes the friction between the flanges and rails; page 135, where he describes the friction in passing curves, and one of the great modes by which it was then and is now avoided, viz. by the use of slightly conical or rather curved rims to the wheels, and the T rail. As to the necessity of his trucks so swiveling upon a central point at A and A, in the figure, see page 179 and 118-19-20-21. "And in railroads there is another circumstance to be considered, the pressure on the rails should not be materially altered by any slight depression of one side of the road." page 179. The body rests on the wheel-frames at A, A, and is connected to them by an axis, on which the frames turn, when from any inequality the axes of the wheels are not in the same plane.

Page 94. "If the body rests upon the wheel-frame of each set of four wheels, in the middle of its length, and it is connected with these frames so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure." The author describes also, page 135 : Curves, and the friction occasioned thereby, and the fact that the two rails are not in the same plane, or on the same level. "And under all these circumstances of one side of the rails being higher or lower than the other, and passing curves, the carriage is to be so made as to have the wheel-frames *turn* so as to maintain an equal pressure, under all these circumstances, upon each wheel, and to conform to all these curved lines and irregularities of the road. Springs are mentioned as proper to be applied to passenger cars, or heavy freight cars, and on locomotives, on page 12 and 13, 173, 174. I therefore think that the purpose of Tredgold, shown in the drawing, and expressed in his work, is to make such an eight-wheel car as would pass all the curvatures and unevennesses of the road, carry great weights safely and easily over the roads, besides dividing that weight among eight wheels. But there was nothing original in Tredgold. He merely took the Chapman wagon or car, and took off the side bearings for the purpose of obtaining a greater equilibrium of the road.

To the thirty-sixth cross-interrogatory, the witness saith :

36 X. None of the cars I know of were so employed.

To the thirty-seventh cross-interrogatory, the witness saith :

37 X. I have not ; I have nothing to do with the case.

To the thirty-eighth cross-interrogatory, the witness saith :

38 X. I am connected with the Erie Railroad ; they are eight-wheel passenger and freight cars ; also four-wheel cars.

To the thirty-ninth cross-interrogatory, the witness saith :

39 X. I have not formed such an opinion as the question supposes, and never had any conversation as alluded to in the question.

To the fortieth cross-interrogatory, the witness saith :

40 X. I am not a member of any such association.



41 X. I have neither seen, heard, or had stated the substance of the foregoing interrogatories.

[Further interrogatories, page 659.]

To the additional direct interrogatories on the part of the Respondent, the witness answers :

To the first interrogatory, the witness saith :

1. So far as I know, Mr. Winans has never made any claim upon any road I have had to do with. I never heard till about a year ago that Mr. Winans had any patent or made any claim to any improvement the eight-wheel car. I have been told that about two years ago and previous to my connection with this company, Charles D. Gould sent out a circular to this road.

To the second interrogatory, the witness saith :

2. In my judgment it would not.

To the third interrogatory, the witness saith :

3. No, sir, it would not.

To the fourth interrogatory, the witness saith :

4. There is not.

To the fifth interrogatory, the witness saith :

5. There is not.

To the sixth interrogatory, the witness saith :

6. There is not.

To the seventh interrogatory, the witness saith :

7. I reply negatively, to both these inquiries.

To the eighth interrogatory, the witness saith :

8. There is great difference between these theories, both in philosophy and in practice ; and that difference is elemental and essential.

To the ninth interrogatory, the witness saith :

9. No, sir.

To the tenth interrogatory, the witness saith :

10. No, sir. Trucks should not be capable of swiveling without control, nor of swiveling too readily from one side to the other ; because such swiveling increases unnecessary friction, wastes the power of the locomotive, injures the wheels and rails, makes the truck and car unsteady in its motions, and increases the jolts and jars, and the liability to quit the track.

[Further cross-interrogatories, page 660.]

To the additional cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

To the first cross-interrogatory, the witness saith :

1 X. The theory I refer to is, that unnecessary friction is avoided by the close proximity of the wheels in each truck ; and that steadiness and evenness and safety are attained by his peculiar mode of making the spring truck and connecting the trucks with the body without side bearings, and the trucks being placed at or near the ends of the body.

To the second cross-interrogatory, the witness saith :

2 X. Prior to 1830, the rates varied much on different roads. Coal waggons and freight cars moved slow ; travellers at twelve or fifteen miles ; perhaps at times slower, and often faster.

To the third cross-interrogatory, the witness saith :

3 X. They have always been so constructed down to the present time.

To the fourth cross-interrogatory, the witness saith :

4 X. Two; the Stockton and Darlington, and the Liverpool and Manchester.

To the fifth cross-interrogatory, the witness saith :

5 X. All railways then built were used for freight; some for passengers. Locomotives and stationary engines were introduced about this time.

To the sixth cross-interrogatory, the witness saith :

6 X. The speed for freight was five or six miles per hour, and for passengers as high as twelve or fifteen miles per hour.

To the seventh cross-interrogatory, the witness saith :

7 X. I have not.

WM. J. McALPINE.

Subscribed and sworn before me, this November 11, 1853.

JOS. F. SABINE, *Com'r*, &c.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 11th day of November, 1853, William J. McAlpine, of the city and county of Albany, and State of New York, being the same person named in the foregoing commission, appears before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my chambers in the St. Nicholas Hotel, in the city of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me and by my clerk in my presence, before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 11th day of November, A. D. 1853.

JOSEPH F. SABINE, *Com'r*.

DEPOSITION OF HENRY WATERMAN.

Henry Waterman, a witness on the part of the Respondent, being duly sworn, in answer to the direct interrogatories, saith :

[Interrogatories, page 649.]

To the first interrogatory, the witness saith :

1 X. My name is Henry Waterman; I am 39 years of age; place of business is the city of New York, and residence at Hudson city; I am a mechanical engineer.

To the second interrogatory, the witness saith :

2 X. Since 1831, my life has been devoted to the study and practice

of the sciences, in their application to the mechanic arts. My first study and labor was in the planning and construction of steam engines, in 1831. I was then constructing steam engines. I then and subsequently engaged in the construction of a great variety of machinery used at that day; and have been ever since and still am engaged in devising, planning, drafting, and constructing many different classes of machines. I have made the principles of machinery the study of my life, both theoretically and practically. In the winter of 1837 and '8, I took charge of the machinery of the Hudson and Berkshire Railroad. My duties then (being in the earlier period of the development of railroad machinery) were to invent or adapt, plan, arrange, construct, and repair the railroad machinery of every kind, including cars and locomotives. With brief intervals, I have, from that time up to April, 1853, directly or indirectly, been connected with similar duties, as to said railroad machinery. I am now no longer connected with any railroad company; but my time is wholly engaged in prosecuting inventions for the perfecting of railroad machinery. So far as I know, I was the first person who run successfully the eight-wheel engine, having the four driving wheels connected; for a peculiar plan of which I hold a patent, issued in 1840. I believe I was the first person who invented what is called the swinging bolster, adapted to the eight-wheel car; this was used by me in 1839. I am also the inventor of the dumb engine, it being invented for use in cities, (it being a condensing locomotive, intended to pass through cities without noise or other nuisance.) This was invented by me in 1847. I am now taking out my patent for it. So far as I know I was the first to make use of India rubber springs under cars; this was done by me in 1839. I was the inventor of the essential features of the modern fire engine, now extensively used, and known as the piano engine. There are many other things which it cannot be necessary to mention, which indicate the mode in which my time has been employed.

To the third interrogatory, the witness saith:

3. I am.

To the fourth interrogatory, the witness saith:

4. I have.

To the fifth interrogatory, the witness saith:

5. I have examined the model, and find it does not differ from the specification in any essential particular.

To the sixth interrogatory, the witness saith:

6. The essential and elemental parts are *two* trucks of four wheels each, in a strong rectangular frame, so built as to keep it square, and connected with a frame, by some device, which will permit it to swivel under it, so as to follow the track.

To the seventh interrogatory, the witness saith:

7. They have. Cars now in use have improvements not suggested in the patent. Among others I may mention one designed to enable each wheel to yield to any irregularity or inequality of the road, by giving it a separate motion vertically upon a spring, so that the shock shall be but slightly, if at all, felt by the truck, while the wheel is confined to a vertical movement, and not permitted to get out of the square of the truck. Another improvement is designed to prevent the cars from being thrown out of perpendicular by the centrifugal force in passing

curves. A variety of inventions, designed to render it safe, in rapid travelling, to intrust the trucks solely to the guidance of the rails. Also, contrivances to avoid friction, by use of Babbett's patent soft metal bearings, and other inventions of great importance. Also, contrivances for producing steadiness and evenness of motion in the car body, by employing the gravity of the load, and the tendency to resist a change in the line of motion, to resist not only the vertical but the lateral impulse imparted by the curves or irregularities of the rails. Also, contrivances to prevent the jerking and bunting motions in sudden stopping and starting.

Also, contrivances for the simultaneous application of brakes to the eight wheels, in order to give control of the trains in rapid motion, without which it would be unsafe to run at rapid rates.

Also, various contrivances for the safety of the cars and passengers in case of breaking wheels or axles. There are, also, many improvements in the interior of cars for the comfort of travellers, too familiar to need mentioning.

To the eighth interrogatory, the witness saith :

8. They are so constructed. The bolster is usually placed about seven feet from the platform.

To the ninth interrogatory, the witness saith :

9. All eight-wheel passenger cars now used have side bearings. These side bearings are absolutely indispensable to the practical safety and utility of the cars. The reasons are : 1st. To resist the tendency to pass off the track, which, in turning curves, the car acquires, by reason of its centrifugal force. 2nd. To control, by the friction of the upper and under side bearings against each other, the tendency of the trucks to the serpentine or wobbling motion, which motion all trucks have, more or less, according to the distance of their bearing points from each other, as compared with the gauge of the track and the radii of the curves. 3rd. To prevent the rolling or tipping of the body from side to side, which movement is very unpleasant to passengers, and dangerous, as well as injurious to the road. I mean by the rolling, something different from that produced by the centrifugal force. It occurs mostly upon the straight track, and is produced by a coincidence in time between the usual vibrations of the car body and the accidental vibration of portions of the track. When this coincidence takes place, the cars have a greatly increased vibration, sometimes called a swinging motion, which is very unpleasant as well as dangerous ; and this swinging is altogether out of proportion to the irregularities or inequalities of the track. A car supported upon centre bearings is continually liable to this swinging. Side bearings interrupt this vibration, and almost entirely prevent it.

To the tenth interrogatory, the witness saith :

10. Check chains are in universal use to prevent the too free and too far swiveling of the trucks, and to hold up the truck and keep it square in case of running off the track or breaking a wheel or axle.

To the eleventh interrogatory, the witness saith :

11. Such increase or diminution of length clearly does not introduce any new or different mechanical principles ; nor does such a change require invention.



To the twelfth interrogatory, the witness saith :

12. They are neither safe nor practically useful. The metal composing the springs that connect the wheels, is liable to constant depreciation of strength by its vibration, and is so liable to break that it could not be relied upon ; and such a break in that truck would certainly do great injury, and probably destroy the life of some of the passengers. The second reason is, that these spring trucks will not keep square, but lose their rectangular form by the transverse pressure, which will cause the truck to run off the track. Third, Another reason why it is dangerous also, is that the vibration of the springs will allow the axles to get out of parallelism with each other, which adds to its dangerous character before explained. Fourth, In passing curves the inside wheel of the truck tends to crowd itself forward and the outer wheel to be retarded, both by the friction of the flange on the rail, and by the slipping of the treads of the wheels upon the track, rendered necessary by the unequal length of the two rails of the curve. Both these curves combine to wrest the truck out of the square shape, and add greatly to the danger of its crossing the track. This renders a rigid unyielding frame absolutely necessary. Fifth, The application of breaks, as shown on Winans's drawing, to such a truck as he describes, would undoubtedly be attended with imminent danger of breaking down the trucks ; because the springs would solely be depended upon to sustain the gravity of the load, to resist the momentum of the load, which would be more dangerous in proportion to the suddenness with which the brakes were applied ; and finally, the springs would be required to resist the tendency to rupture caused by applying a lever purchase by the brake itself upon the most tender and fragile part of the spring. All these strains must be borne by the weakest part of the spring ; and also the lateral strain upon the spring caused by the twist of the truck in going round the curves. Taking all these things together I think that nothing which could, under any circumstances, be called a steel spring, would be capable of being used any length of time without rupture. These springs, made as directed in the patent, would easily be twisted like the opening of the leaves of a fan, and thus would allow the truck to twist on the track. Any spring connecting the axles of the wheels, without side bearings, would permit the swinging motion of the cars, and also be dangerous in that respect. I have had much experience in the application of springs, in almost every form and shape, to railway cars ; and I can say with confidence that such a truck would be entirely unsafe and unfit for use. I never saw such a truck in use under a passenger car, and I do not think that any one would be justified in risking the lives of passengers upon it.

To the thirteenth interrogatory, the witness saith :

13. The drawing shows the brakes adapted to swiveling trucks ; specification mentions no mode of using brakes ; and none occurs to me by which brakes could be adapted to the truck without breaking the springs. The drawing shows a conical pivot, marked X, having sockets and bearings extended far beyond the centre of the bolster ; also a pocket Y in the lower bolster corresponding. The specification calls for a plain bolster, of wood or iron, extending across from the tops of the opposite springs, and united at its centre by a king-bolt,

and swiveling in the manner of the front bolster of a common road waggon.

In the drawing is exhibited a coupling bolt, for drawing the car from the middle of the end of the body; nothing about drawing the car appears in the specification. The latter prescribes a mode of fastening the ends of the springs which unite the axles, by bolting them on top of the boxes. The drawing represents pockets for the ends of the springs to work in—thus introducing a very important difference in the action of the springs. The position of the bolsters, in the drawing, is five or six feet from the ends of the platform of the car; and the specification places them at, near, or beyond the ends of the body, and never farther under the same than is required to prevent the wheels from protruding beyond the end of the car. The patent insists upon placing the wheels as near together as may be; the drawing puts a brake between them. The drawing represents not a passenger, but a freight car; the description relates to a passenger car alone. There is also a wide and important difference between the two in the connection of the wheels in each truck; the one representing a rigid right-angled wooden wheel-frame; the specification dispenses with any wheel-frame, and connects the axis by steel springs, bolted to the boxes; and although it is stated, in the patent, that the common bearing carriage might be substituted for this spring truck, yet no description of the construction of such bearing carriage is given, excepting that it is stated that the wheels should be brought very near together. But I do not consider this allusion to the possibility of obtaining the benefits of the said spring truck by substituting the common bearing carriage, as giving any description, such as I am requested to compare with the drawing; nor do I understand that this substituted truck is claimed as embodying any substantial part of the invention claimed by Winans. The position of the leaves of the springs is reversed by the drawing, from their position in the specification, and their connection with the truck and mode of action in the two is essentially different. I never should have built any such car as that shown in the drawing from any suggestions or descriptions contained in the specifications.

To the fourteenth interrogatory, the witness saith:

14. I have.

To the fifteenth interrogatory, the witness saith:

15. It does.

To the sixteenth interrogatory, the witness says:

16. So far as relates to the manner of arranging the eight wheels and the connection of the trucks with the body of the car, he could undoubtedly be able so to do, because in those respects the eight-wheel Chapman carriage is substantially the same as those now in use, and the arrangement is much better than that of Mr. Winans.

To the seventeenth interrogatory, the witness saith:

17. It has them all.

To the eighteenth interrogatory, the witness saith:

18. I have measured; and the distance inquired of is somewhat less than the width of the track. It is just about the same as is employed in the common trucks of eight-wheel cars in this country.

To the nineteenth interrogatory, he saith:

19. It was by substituting a single fixed axle for one of the trucks.

To the twentieth interrogatory, the witness saith :

20. I have examined the book, "Tredgold's Practical Treatise on Railroads and Carriages," published in London, in 1825 ; and have particularly examined the figure 26, plate IV, and the description on pages 91 and 179 ; and in my opinion the same describes an eight-wheel car.

To the twenty-first interrogatory, the witness saith :

21. It has the rigid wheel-frames, with the wheels in each frame a proper distance apart to run well on curves and straight lines of road ; and shows and describes the axis on which each frame is to turn, to suit the changes of the level, divide the pressure equally among the wheels, and traverse the road. The same means by which it divides the pressure, and conforms to the changes of level, necessarily enables it to conform to the curves and other inequalities of the road ; and this construction is the only one that will divide the pressure equally among the wheels, and run on the road ; and that is the circular bearing and axis at the points A, in each frame, equally distant from the wheels. It is the same, in its principles of construction and operation, as the eight-wheel cars now in use on railroads generally. This car, as described and shown in the book, will divide the pressure equally among the wheels, will conform to the changes of level, and will fulfil all the other purposes expressed by Tredgold. The same means, that is, the vertical axis in the frame, that enables it to divide the pressure equally among the wheels, and conform to the changes of level, also necessarily allows the wheel-frames to turn between the rails, to suit the curves of the road, and also all the other inequalities of the road, both horizontal and vertical ; and this action of turning is also necessary to enable a car to run on a railroad, which is the purpose for which it is described by Mr. Tredgold. There is no way in mechanics, of dividing the pressure of the body among the wheels, other than by the vertical axis, and middle bearing, as shown in the model A ; which also necessarily allows the wheel-frames to turn, and follow the course of the road, both in its curves and straight lines. The treatise of Tredgold, in various passages, mentions the application of springs to reduce the force of the shocks, both on the bunters and to other parts of the carriage, when it is to be used for the transportation of very heavy freight or of passengers, in order to make the body ride easily.

To the twenty-second interrogatory, the witness saith :

22. I have examined model A, and compared it with the description. It is a correct representation of the eight-wheel freight car described by Tredgold ; the car for passengers would require the addition of springs. I have examined the model C. It does not correspond with Tredgold's drawing, in its principle of construction ; nor with his description, in construction nor in operation. It will not divide the pressure among the wheels—will not turn to suit the resistance of the changes of level, or inequalities that throw the axles of the wheels out of plane, and it has no means of turning ; it will not run on a railroad, but will run off the track certainly, at the curves. No mechanic of the most ordinary capacity even, it appears to me, could or would construct such a thing from the directions contained in the description, or with any regard to the purposes the author states it is designed to answer.

To the twenty-third interrogatory, the witness says:

23. I have often made the comparison. They are substantially identical in their mechanical principles and mode of operation, so far as regards the arrangement of the wheels and the connection with the body, except that the modern cars, including those of the Eastern Railroad, do not bear all the weight of the load on the centre of the bolster or trucks, as Tredgold does; but on the contrary, they bear nearly all, if not all, of the weight on side bearings; and this difference, as I have before expressed, is essential.

To the twenty-fourth interrogatory, the witness saith:

24. It is designed to answer the purposes which Mr. Winans's improvements were intended to accomplish; but it is so organized as to accomplish those objects in a much more practical manner, because the wheels in each truck are farther apart, and the wheel-frame rigid; but both Tredgold and Winans have the defect of attempting to bear the weight of the load on the centre of the truck, and not on side bearings.

To the twenty-fifth interrogatory, the witness saith:

25. I have seen the patent and drawings. The drawing shows an eight-wheel double swiveling truck car, which answers to the description of Winans, excepting that it has the centre bearings enlarged in the form of a transom plate; and it has a solid truck-frame, and not a spring connection between the axles; and it contains a provision to enable the axles of the wheels to travel forward or back to a certain extent in their bearings, so as to be enabled more nearly to coincide with the radii of the curves they are passing. It has, in common with Winans, the great defect of the too close proximity of wheels.

To the twenty-sixth interrogatory, the witness saith:

26. Such a mechanic would undoubtedly be able so to do without invention; and in so doing, he would embody all the essential principles of construction and operation of the eight-wheel cars now in common use. To obtain from Fairlamb's patent the beneficial results set forth by Winans's specification, as being obtained by his improvements, it would be necessary that a mechanic should make certain alterations in the car shown in Fairlamb's structure; and the first would be, to place the wheels further apart on each truck, as was done by Chapman and Tredgold; and 2d, to adopt their mode of keeping the axles in fixed bearings, and not to allow the axles to approach or recede from each other, as is done by Fairlamb in one mode, and by Winans in another. With these changes, which required no invention, a common mechanic would be able to make a car that would contain all the beneficial results above stated.

To the twenty-seventh interrogatory, the witness saith:

27. I have examined the Allen steam carriage minutely. It has all the essential elements of the common eight-wheel railroad car, combined in the same manner, and calculated to attain the same beneficial results actually attained by the common car, and claimed to be accomplished by Winans' patent. It has two trucks, of four wheels each, in rigid frames, swiveling upon a centre bolt, under one body, with friction roller side bearings and spring pedestals; evidently designed to answer and capable of answering the objects stated as desired by Winans's specification. The distance of the wheels apart, in each truck, is more judicious than that prescribed by Winans. The spring pedestals are of



great advantage, not only in ease of motion, but giving power to each wheel to enter or surmount irregularities of the rails without so much disturbing the course of the truck. Two of the wheels are driving wheels, but the connection between the driving wheels and trucks being such as not to impede the power of the trucks to swivel, and thus conform to the rails, would not make any practical difference between the action of these trucks and those of ordinary cars.

To the twenty-eighth interrogatory, the witness saith :

28. I have examined the model of the car, marked "Bryant," now shown to me. It is built of two four-wheel trucks, swiveling under the ends of a platform, and is obviously adapted to run smoothly, and pass all the curves, inclined planes, irregularities and inequalities, as well as straight track of any railroad. In my judgment its construction and mode of operation are the same as the cars of the Eastern Railroad, and those in common use in this country.

To the twenty-ninth interrogatory, the witness saith :

29. All that is essential. But it differs from Winans's car in having a rigid wheel-frame and also side bearings.

To the thirtieth interrogatory, the witness saith :

30. Undoubtedly he would.

To the thirty-first interrogatory, the witness saith :

31. I have seen Wood's Treatise, published in 1825, and Tredgold, and various others, but not Strickland. The mode of drawing by the middle of the end of the body, was well known and publicly used before 1830.

To the thirty-second interrogatory, the witness saith :

32. I have examined the works inquired of, except Strickland. The distance of the axles apart, as shown in them, is somewhat less than the width of the track, and is about the same as is now used in ordinary cars in the United States; but the best cars now constructed are built with the wheels spread further apart in each truck than is shown in these treatises.

To the thirty-third interrogatory, the witness saith :

33. The spring pedestals now in common use were well known in England, in 1830, as applied to railway carriages and locomotives. They were made use of by Mr. Stevenson, the English engineer, before that time. They were described and shown in the London edition of Wood's Treatise, published in 1831, which I have examined; also they are shown in Allen's model. They were well known long before 1830.

To the thirty-fourth interrogatory, the witness saith :

34. These two modes were well known, and were described and shown in sundry printed works before 1830. They were represented and shown as equivalents for each other; and they are equivalents. Both modes were then and still are in use; each mode has its advantages; sometimes one wheel revolves on the axis, while the other is fixed to the axis, in order to enable the wheels to avoid the necessary slipping in passing curves. Wheels may be constructed to revolve upon the axis in the same manner as the Quincy car, with equal safety as those in common use at high speed; but it would require more expense for construction and repairs.

To the thirty-fifth interrogatory, the witness saith :

35. None of the changes involved any change of principle or mode of operation ; nor do they require any invention to produce them.

To the thirty-sixth interrogatory, the witness saith :

36. The distance of the flanges is not material ; it may be increased or diminished by altering the size of the wheels.

To the thirty-seventh interrogatory, the witness saith :

37. It is ; because the bearing points of the wheels upon the rails are the only ones through which the guiding effect of the rails is transmitted to the cars through the truck.

To the thirty-eighth interrogatory, the witness saith :

38. To construct a truck which will be safe, and practically useful, and one not unnecessarily injurious to the rails and wheels, the axes must be kept at a fixed and uniform distance from each other while running. I have myself tried many experiments, and given much attention to this subject, for some years past, for the purpose of practically investigating this subject. I have been surprised to find how small a deviation from exact parallelism in the axes of the wheels of a truck, in cars and in locomotives, has been attended with destructive consequences. I have found, by repeated experiments, that the variation from parallelism not exceeding one eighth of an inch, has been attended with a very destructive impingement of the flanges upon the rails, and consequent danger ; and that by correcting this want of parallelism, the difficulty has been at once removed. Any arrangement, by springs or their equivalents, that would permit the distance of the wheels to vary from each other, even in a comparatively slight degree, would be attended with great danger at high rates of speed. This danger is greatly enhanced by the use of springs, which, when the wheel meets an obstacle on the track, (as a bad joint in the rail,) is suddenly and violently compressed ; it then either breaks or violently reacts, and tends to give a sudden change to the direction of the wheels. And some contrivance to prevent the application of brakes from destroying the springs, and suitable side bearings, and some other additions, might answer for freight cars at a slow rate of speed ; but it would, according to my experience, never answer for passenger cars, at the usual rate of speed.

To the thirty-ninth interrogatory, the witness saith :

39. I do not, at this moment, recall any thing in particular.

To the fortieth interrogatory, the witness saith :

40. One theory of the specification is to bring the wheels as near together as may be in each truck ; to make the axes of the wheels coincide, as nearly as possible, with the radii of the curves of the road, and to make the wheels on each side of the truck resemble, as nearly as possible, the action of a single wheel. And this peculiar theory of construction is stated to be for the purpose of avoiding unnecessary friction in passing curves, as well as to make the car run more steadily on the straight parts. This theory is not sound, nor consistent ; because closer proximity of the wheels in each truck will cause the axes of the wheels to become more transverse to the radii of the curves ; because the trucks wobble more, and produce more instead of less friction on the curves and all other parts of the road, and run less steady on the straight and curved parts of the same. The greater the distance of the

treads of the wheels, the greater the leverage of the rails in guiding or swiveling the trucks. But there are extremes in all things. The treads should not be so far apart as to bring all the eight flanges in contact with the rails at the same time in passing curves. The wheels must not crowd. I have tried the experiment on locomotive trucks, at high velocity, when we have been compelled, by want of room, to place the wheels on the swiveling truck close together, in order to accommodate other parts of the machinery; and whenever the trucks have not been controlled by side bearings, which had sufficient friction to prevent the free swiveling of the trucks, they have invariably been attended with a violent and dangerous serpentine motion on the track; and I believe could not be run with any safety without such control. Another great difficulty in this part of Winans's theory is, that it brings the wheels so near together that they follow each other in shocks on the same inequality of the rail, so quickly as to blend the shocks so much together as to become like the action of a single wheel with a single shock, without giving the front wheel a chance to recover before the next wheel strikes; thus losing one of the advantages of the eight-wheel over the four-wheel car, and increasing the risk of accident; while this difficulty is remedied by spreading the wheels further apart, as in the trucks now in use, which are about as far apart as the ordinary four-wheel cars in use at the date of Winans's patent.

That part of Winans's theory relating to the connecting the axles of the wheels by springs, I have already stated, and my reasons for considering it not correct.

Another part of Winans's theory is, that which relates to the connecting the trucks with the body, by bearing the whole weight of the body upon the centre of the bolster, and the centre of the truck. This is also erroneous. I have already stated my reasons for considering this theory visionary and erroneous.

Another part of his theory relates to the obtaining steadiness of motion, by supporting the body at or near the two ends. This I believe to be correct, and in accordance with the directions of all who have written on the subject, as Tredgold, Chapman, and others, and the universal practice of all car builders. No other way of support would be practicable.

As I have before repeatedly said, a car constructed according to the theory or specification of Winans, whether the truck with springs, or the "ordinary bearing carriage" mentioned in the patent, are employed, having the wheels near together, as there directed—a car thus built would, in my judgment, be unsafe, and of no practical utility.

To the cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

[Cross-interrogatories, page 654.]

To the first cross-interrogatory, the witness saith :

1 X. I have already stated my experience.

To the second cross-interrogatory, the witness saith :

2 X. I have; and I have already stated all that I recollect in relation to it.

To the third cross-interrogatory, the witness saith :

3 X. I have been repeatedly examined as an expert in causes de-

pending upon the principles of physical science, on a variety of subjects, especially upon questions of mechanics.

To the fourth cross-interrogatory, the witness saith :

4 X. I have been accustomed, during almost the whole of my active life, to make comparisons and examinations of machinery, of inventing, planning, and constructing the same ; of analyzing these elements and principles of construction and action, and of tracing out the laws of their organization, with a view to the attainment of a thorough knowledge of my profession, and to practice it with reliance upon the conclusions of my own judgment, and to entitle myself to the confidence of others.

To the fifth cross-interrogatory, the witness saith :

5 X. I am not in the employ of any railroad.

To the sixth cross-interrogatory, the witness saith :

6 X. I answer the question affirmatively in all its branches.

To the seventh cross-interrogatory, the witness saith :

7 X. The eight-wheel car should be so constructed as to avoid all unnecessary friction in moving round curves and also on the straight track. It will not do to make trucks which will answer only *one* of these purposes. All friction should be avoided that is not rendered necessary by a regard to the proper and safe construction of a truck, so as to answer all the purposes for which it is designed.

To the eighth cross-interrogatory, the witness saith :

8 X. As a general or abstract statement, I answer in the affirmative.

To the ninth cross-interrogatory, the witness saith :

9 X. This question I answer in the *negative*. On the contrary, I have seen, upon the Hudson River Railroad, upon which I was employed as master of machinery, where the speed of the trains is the highest of any in this country, and a road of more than an usual amount of the curvature, the use of two classes of trucks, the one with the wheels nearer together and the other farther apart. The wheels which were nearest together cut the flanges and rails to a great extent, so as to *injure both*, and produce a great degree of unnecessary friction ; while on the same road and at the same time, other trucks, with the bearing points further apart, that is, about five feet apart, have run for months upon the same road in the same trains, without the flanges having scarcely touched the rails. These flanges being of malleable iron, would show if they had rubbed the rails ; but I have often examined them, and they showed no marks of it.

To the tenth cross-interrogatory, the witness saith :

10 X. I do not understand what is meant by "independently of other considerations," and therefore cannot answer the question in the abstract. The greatest possible freedom of motion in a truck, is never allowed in practice ; it could not be made consistent with safety or utility.

To the eleventh cross-interrogatory, the witness saith :

11 X. I am so acquainted. I began my studies in 1826, as to railroad engineering. My means of knowledge are : reading of scientific works on the subject, experience and reflection.

To the twelfth cross-interrogatory, the witness saith :

12 X. Steadiness of motion is essential in a railroad car for passen-



gers. The four-wheel cars are as steady as the eight-wheel cars, if properly coupled in a train. The English mode of coupling answers this purpose. In this country we have not paid sufficient attention to the couplings.

To the thirteenth cross-interrogatory, the witness saith :

13 X. Certainly; if it is designed to be so used.

To the fourteenth cross-interrogatory, the witness saith :

14 X. It is not important to the proper working of the first car in a train, that its trucks should have the same freedom of motion that any other truck in the train has. If the first truck has sufficient freedom of motion to swivel to the curves and irregularities of the road, that is all which is material; and it is of no consequence whether other trucks have more freedom or not. An important part of the use of side bearings, is by their friction against each other, to prevent too great freedom or ease of swiveling; and the friction occasioned by the draft of a train of cars upon the king-bolts, though it would be less upon each succeeding king-bolt, would not be in any one car of sufficient importance to interfere practically with the freedom of swiveling of the first car or any other one in the train. There is another circumstance which would make the friction on the *king-bolt* much less when the cars are in motion, than if at rest; it is the constant jarring of the car on the rails. While this jar is occurring the change of position of the truck will often take place, with little or no friction on the king-bolt when the draft is through it; so that this element of the friction is trifling in the case supposed.

To the fifteenth cross-interrogatory, the witness saith :

15 X. It is not essential in order to give sufficient freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them.

To the sixteenth cross-interrogatory, the witness saith :

16 X. The model B represents fully as large an extent of bearing surface between the bolsters, as prescribed in the specification, but much less than what is shown in the drawing.

To the seventeenth cross-interrogatory, the witness saith :

17 X. The model represents no mode of drawing.

To the eighteenth cross-interrogatory, the witness saith :

18 X. The particular form of spring is not described. A particular mode of constructing the truck is described. The particular truck mentioned has no framing. The springs and axles are united without the use of a frame.

To the nineteenth cross-interrogatory, the witness saith :

19 X. To embody all that is essential and elemental in the eight-wheel car, and all that distinguishes it in its mechanical principles and modes of operation, from the four-wheel car in common use before 1830, it is not necessary to make use of springs; but to accommodate it to the use of passengers, some device must be used to take off the jolts and jars. For that purpose steel and India rubber springs, and the elasticity of confined air and *floating pistons* mentioned in pages 12 and 13 of Tredgold, and various other devices have been used. In more recent times they are adopting wooden springs.

To the twentieth cross-interrogatory, the witness saith :

20 X. The drawing of Chapman shows a four-wheel car. This is

drawn by the body. The No. eight represents a six-wheel car with one swiveling truck. The patent, page 139, describes the mode of constructing an eight-wheel car, with two swiveling trucks. No other mode of draft but that by the body is shown or suggested in the patent. I refer to the first entire paragraph on page 139.

To the twenty-first cross-interrogatory, the witness saith :

21 X. No other mode of drawing, except by a draw link attached to the body, is shown in Tredgold's work. I refer to Plate 1, fig. 1 and 2, as showing the draw links.

To the twenty-second cross-interrogatory, the witness saith :

22 X. There is such description and drawing. The drawing of the eight-wheel car in the sketch, in Fig. 26, Plate IV, is precisely as I should make it to-day, if I was desirous to represent a swiveling truck; as those acquainted with the subject would see, that the double lines shown above the letter A on the drawing, indicate plainly that the king-bolt or vertical axis is to have a lateral or swiveling motion within the socket or thimble. I refer to the Treatise of Tredgold, pages 42, 43, 135, 12, 174, 173, 133, 101, 93, 94, 118, 119, 120, 121, 12, 13, 179, 95.

To the twenty-third cross-interrogatory, the witness saith :

23 X. I have stated in my former answer what elements of the car described in Winans's specification, are embodied in the Allen steam carriage, and wherein there were diversities in their structure.

To the twenty-fourth cross-interrogatory, the witness saith :

24 X. I make the same answer to this, in relation to the Quincy car, as I made in the twenty-third answer as to the Allen carriage.

To the twenty-fifth cross-interrogatory, the witness saith :

25 X. I answer this question in the affirmative. In 1830, locomotives in England had attained, at times, a speed of thirty miles an hour, although the usual rates of passenger travel varied from ten to fifteen miles per hour. But a rail car that was capable of being drawn at the rate of twelve to fifteen miles per hour, would require no change of its principles of construction or operation to render it fit to travel at thirty miles per hour; although it might require or suggest some alterations of proportions and adjustment of details. This is equally true of four-wheel and eight-wheel cars. The same description of four-wheel cars, that in 1830 ran at a speed of ten miles per hour in England, and in the United States, afterwards ran at a rate of speed of fifty and sixty miles per hour.

When a mechanic once had before him the plan of a car body, supported upon two trucks swiveling under it, so as to be capable of conforming to all the curvatures and irregularities of a railroad, he would there see embodied those requirements and characteristics of a railroad car, which would enable it to move over these curves and irregularities, and perform the duties now required of railroad cars. If he wished to transport passengers with the greatest ease, he would follow Tredgold's recommendation, and adopt springs or their equivalent; or would adopt springs in some one of the various modes familiarly known and used previous to 1830, and shown in the works I have before mentioned, and in other works—among which I might suggest the floating spring, applied, in 1826, by Nicholson, for that purpose, and shown in his works published at that time, or such springs as were in common use on many

four-wheel cars. Increasing the speed of railway cars does not create the necessity of any arrangement or combination of parts that is *essentially* different from those that are practically useful at low rates of speed. The intensity of shocks is increased as speed increases, but the same organization and arrangement of parts that are best calculated to enable the car to move smoothly and steadily at one rate of speed, say at twelve or fifteen miles per hour, is best adapted to accomplish the same result at increased rates. There is no new physical law of action or reaction developed by increasing the rates of speed, and therefore no necessity for any organization of the car essentially new, in order to meet the requirements of increasing rates of speed. The difference in intensity of shocks between cars running twenty-five miles per hour, and those running at forty miles, is very much greater than that difference between cars running ten miles and twenty-five; yet a car that is well adapted to run twenty-five miles per hour, has all that is essential to enable it to run forty miles per hour; and so a car well adapted to run ten or twelve miles per hour, will have all that is essential to run twenty-five miles per hour, except that the parts may require to be built stronger. The sources of knowledge that a car builder would have had, would be the books I have mentioned, the inventions I have described, and the experience he would have had with the four-wheel cars, and with either Tredgold or Chapman, or the Quincy or the Allen carriages. In these he would have had all that was necessary to exhibit an embodiment of the essential elements of the eight-wheel car, as now used; and if he had had intelligence enough to observe their operation, he would have been able to perceive in them their adaptation to the purpose of rapid travelling. I have explained my view as fully as I can.

To the twenty-sixth cross-interrogatory, the witness saith:

26 X. I have already answered this question.

To the twenty-seventh cross-interrogatory, the witness saith:

27 X. I have taken it for granted that the draft was applied to the truck on the Quincy car.

To the twenty-eighth cross-interrogatory, the witness saith:

28 X. As I have before stated, the different modes of draft have their different advantages; but I do not consider it a matter of indifference which is chosen.

To the twenty-ninth cross-interrogatory, the witness saith:

29 X. The cars referred to in Wood, were four-wheel cars. I have not seen Strickland. In Tredgold, the draft by the body being the only one shown in the book, is applicable to the long body as well as to the short one, and to the body of the eight-wheel car as well as to the four-wheel car, no reason being shown or assigned for any change of draft to be made in one different from the other. In Tredgold the wheels were not attached to the body. In Chapman the draft was by the body also.

To the thirtieth cross-interrogatory, the witness saith:

30 X. The draft of the Chapman car is by the body, and although the drawing is only of the four and six-wheel car, the direction of the patent is to duplicate the trucks; and common sense understanding of the specification and drawing would show that the traction of the six-wheel car would not be altered by reason of substituting a second

truck instead of a single axle. The same observation applies to the Tredgold car, as shown in his treatise.

To the thirty-first cross-interrogatory, the witness saith :

31 X. None of these treatises or inventions would lead to such fallacy.

To the thirty-second cross-interrogatory, the witness saith :

32 X. I cannot tell what is meant by "*great length*," as no standard of comparison is given. Stability of motion of the body of the car depends on many other causes, independent of the mere length of the body; and among them the more obvious are: the absolute gravity of the body; the height of its centre of gravity above the plane of the rails; the steadiness of the trucks, and a proper distance of the wheels apart in each truck, as already explained, and so as not to allow two wheels at once upon an unsupported span of rail; the proper adjustment of springs, or their equivalents, to the weight of the load, and to the direction of the impinging forces, and the peculiar characteristics of the track; the proper adjustment of the mode of draft, and of the direction of the line of traction; and the adoption of the proper modes of coupling; and a proper and careful adjustment of the distance between the treads of the wheels in the two trucks, and the length of the rails, so that while the front wheels in one truck pass the joints of the rails, the corresponding wheels of the rear truck shall also pass corresponding joints, in order that both ends of the car shall rise and fall simultaneously and not alternately; also a proper adjustment of side-bearings to prevent the lateral vibration I have before mentioned. The length of the body alone is a comparatively unimportant element in the stability of motion; its gravity has far more to do with this than the length of body. Indeed my experience shows me that the length of body has little to do with steadiness of motion, except so far as it necessarily requires increased weight in its construction. I have run upon locomotives with short bodies, but of heavy mass, as steadily and smoothly as any eight-wheel car of a long body ever ran; but it was the *weight* and balance—not the length, that gave it steadiness and ease. In these opinions as to the effect of lengthening or shortening the body, I agree with Mr. Winans in the views expressed by him in his specification, that "*this relief from shocks and concussions, and from lateral vibrations*" is "*not materially varied by increasing or diminishing the length of the body while the extreme ends of it continue to rest on the bolster of the bearing cars.*"

To the thirty-third cross-interrogatory, the witness saith :

33 X. Nothing ever yet taught me that the assumption made in this question is founded in truth.

To the thirty-fourth cross-interrogatory, the witness saith :

34 X. No modification was necessary merely in order to run them at high velocities.

To the thirty-fifth cross-interrogatory, the witness saith :

35 X. The purposes shown and expressed in the description and drawings referred to, were not solely for the purpose of carrying great weight and dividing it equally; but also to enable the cars to conform to the curvatures and irregularities of the railroads on which they were designed to be used, and to carry their loads smoothly and evenly upon them. The wheels were arranged in trucks for this purpose;



and also for the purpose of avoiding unnecessary friction between the flanges and the rails. The long bodies were used to carry greater loads and to obtain greater stability of motion, not by increasing the length but increasing the gravity of the load, while the greater number of wheels would protect the rails from injury. Equalizing the stress on each wheel, was a part of Tredgold's plan, but not the whole of it. The extracts from Tredgold before cited, are the passages in his treatise to which I more particularly refer as regards his car.

To the thirty-sixth cross-interrogatory, the witness saith :

36 X. I have no personal knowledge of the use to which these railroad cars were put previously to 1830.

To the thirty-seventh cross-interrogatory, the witness saith :

37 X. I have never been so employed. I am in no way connected with this case, nor interested in the result of the controversy.

To the thirty-eighth cross-interrogatory, the witness saith :

38 X. I am not connected in any way with any railroad company.

To the thirty-ninth cross-interrogatory, the witness saith :

39 X. I have formed an opinion that Winans's patent might be valid for the peculiar mode of connecting the axles with springs. I have not seen such a connection in any of the prior inventions.

To the fortieth cross-interrogatory, the witness saith :

40 X. I am not a member of any such association as is inquired of.

To the forty-first cross-interrogatory, the witness saith :

41 X. I have neither heard, seen nor had stated to me the substance of any one of the foregoing interrogatories.

To the additional interrogatories on the part of the Respondent, the witness answers as follows :

[Further interrogatories, page 659.]

To the first interrogatory, the witness saith :

1. Previous to the lawsuit of Winans against the Troy and Schenectady Railroad, I never heard that Winans had any patent, or any claim to any invention in relation to the eight-wheel car. I saw Mr. Winans frequently in 1838, and we conversed about eight-wheel cars as well as locomotives. Most of the principal railroads were then using double-truck eight-wheel cars, such as they now use. We together discussed the features of the eight-wheel car and its principles; and in none of these conversations did he ever say or give me to understand, that he had made or claimed any invention in relation to the eight-wheel car, or that he had any patent for it; nor did he intimate any objection to the right of any person to use it; and I was surprised when I heard of the suit, some eight or ten years afterwards. He has never made any claim on me, or on any company that I ever had any thing to do with, so far as I know.

To the second interrogatory, the witness saith :

2. It would not.

To the third interrogatory, the witness saith :

3. No, sir.

To the fourth interrogatory, the witness saith :

4. Nothing that I can perceive.

To the fifth interrogatory, the witness saith :

5. I make the same answer as to the fourth question.

To the sixth interrogatory, the witness saith :

6. I repeat the same answer.

To the seventh interrogatory, the witness saith :

7. There is nothing in said Quincy car, or its uses and objects, which would require the wheels to be equidistant from each other, or render the substitution of a longer body incompatible with the objects it is designed to accomplish.

To the eighth interrogatory, the witness saith :

8. There is a wide difference in the theory of Winans, and that on which the common eight-wheel cars are constructed. That difference I have already explained, and it is essential.

To the ninth interrogatory, the witness saith :

9. I think not.

To the tenth interrogatory, the witness saith :

10. I have already answered this inquiry, in substance.

To the additional cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

[Further cross-interrogatories, page 660.]

To the first additional cross-interrogatory, the witness saith :

1 X. I have already stated what Mr. Winans's theories are.

To the second additional cross-interrogatory, the witness saith :

2 X. I only know from publications, and not from personal knowledge. There was a great difference in the speed of railroads. The coal roads in England were travelled quite slowly. The passenger cars used to go from ten to twelve or fifteen miles per hour. There was no rate that would be called an average speed.

To the third additional cross-interrogatory, the witness saith :

3 X. I do not suppose that any railroad was ever built in any place where concentration of the weight of the cars and locomotives was required. The object upon all roads is to distribute, not concentrate weight.

To the fourth additional cross-interrogatory, the witness saith :

4 X. I have only heard of *two*; I refer to Pambour's Treatise on Locomotives, for my authority.

To the fifth additional cross-interrogatory, the witness saith :

5 X. Horse powers, locomotives and stationary engines were used.

To the sixth additional cross-interrogatory, the witness saith :

6 X. I have given the best answer I can to this inquiry, in my answer to the second interrogatory.

To the seventh additional cross-interrogatory, the witness saith :

7 X. I have designed railroad cars. They were placed upon the Hudson and Berkshire road. They are eight-wheel cars. There were two of them I designed, in 1839.

HENRY WATERMAN.

Subscribed and sworn to before me, this November 5, 1853.

JOS. F. SABINE, *Com'r, &c.*

## ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 4th and 5th days of November, A. D. 1853, Henry Waterman, of the city of Hudson, in county of Columbia, and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my chambers in St. Nicholas Hotel, in the city of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me and by my clerk in my presence, before signing, and was then subscribed by the said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled suit, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 5th day of November, A. D. 1853.

JOSEPH F. SABINE, *Com'r.*

## DEPOSITION OF JOHN B. JERVIS.

John B. Jervis, a witness produced on the part of the Respondents, being duly sworn, in answer to the direct interrogatories on the part of the Respondents, to him specially addressed, answers as follows :

[Special interrogatories, page 794.]

To the first special interrogatory, the witness saith :

1. My name is John B. Jervis ; age 57 years ; I reside in the city of New York ; my profession is civil engineer.

To the second special interrogatory, he saith :

2. I was engaged professionally on the Erie canal, from 1818 to 1825 ; on the Delaware and Hudson Canal and Railroad, from 1825 to 1830 ; on the Mohawk and Hudson Railroad, and Schenectady and Saratoga Railroad, from 1830 to 1833 ; Chenango Canal, and Erie Canal enlargement, from 1833 to 1836 ; on the Croton Aqueduct of New York, and Cochituate Aqueduct of Boston, from 1836 to 1846 ; on the Hudson River Railroad, from 1846 to 1850 ; and subsequently on the Southern Michigan Railroad, Northern Indiana Railroad, Chicago and Rock Island Railroad, and on several minor improvements.

To the third special interrogatory, he saith :

3. I have given considerable attention to locomotive engines, and particularly in regard to the arrangements to distribute the weight, and to provide more easy working on curves and inequalities of the road.

To the fourth special interrogatory, he saith :

4. I invented a new plan of frame, with a bearing carriage, for a locomotive engine, in the latter part of the year 1831, for the use of the Mohawk and Hudson Railroad, which was constructed and put on the road in the season of 1832. The trucks in this engine worked perfectly ; but the boiler, being intended for anthracite coal, did not do well, and another boiler was made for it. Soon after this, a second engine, with

the same plan of wheels and bearing frame, was made and put in operation on the Schenectady and Saratoga Railroad, early in the year 1833. The engine had six wheels; on one pair, the driving wheels, rested in the usual way, one end of the frame of the engine; the other end of the engine rested on the frame of a four-wheel car or truck, so arranged that by means of a centre pin passing through a transom beam, the upper frame on which the engine rested could follow the guide of the lower frame, without necessarily being parallel with it. Friction rollers were placed on the lower or truck-frame, to support the engine-frame, and allow the truck-frame to move freely under it. By this means a long frame for an engine could be and is supported near its end, which provides for the most steady motion of the machine. and by the separate car truck to guide, it passes on curves with all the facility of a short geared car. It may better illustrate, to state some points in this machine, namely: To obtain the power desired in a locomotive, it must have more length than can be carried well on four wheels; for if the wheels are placed near the ends of the frame, they are too far apart to pass curves with proper facility; and if placed as near as required for the proper working of a railway car, then there is too much weight on the unsupported ends of the frame; and projecting, as it must, much beyond the bearing point of the journal of the axle, a vibration of the frame up and down is caused by all vertical inequalities of the rail, producing a severe motion in the machine, very unfavorable to the machine and the road. I have stated that a railway car, (and a locomotive, in all its appointments for running on a railroad has the same requisites), should not have its wheels too far apart. It must pass curves as well as straight lines, and to turn a curve the wheels should not be so far apart as to drive the forward wheel hard upon the rail, nor so near together as would cramp, and cause so much strain as to endanger the parallelism of the axles and frame that holds them. By the plan adopted the forward end of the engine was so supported, that the guiding car could be made of such length between its axles, as should be found best adapted to pass all lines, either curve or straight, most advantageously, and thus guide the engine, and bring round on the curves the driving wheels, with the greatest practicable ease and the least loss of power.

To the fifth special interrogatory, he saith:

5. I wrote a letter to the editor of the American Railroad Journal, dated 18th July, 1833, giving a description of the engine described in the answer to the fourth interrogatory. The letter was published, and may be seen in the second volume of the American Railroad Journal, page 468. I do not know that I have the original of this letter. The following is a copy, as taken from said American Railroad Journal:

*"Locomotive Steam Engine. By J. B. Jervis.*

*"To the Editor of the American Railroad Journal.—DEAR SIR:—The Locomotive Steam Engine for the Saratoga and Schenectady Railroad, of which I promised to give you some account, was put on the road on the 2d inst., and has been in regular operation since, making usually two trips (equal to eighty-four miles) per day, and carrying daily over the road about three hundred passengers.*

*"The engine was made by George Stephenson & Co., at Newcastle, England. The boiler has tubular flues, on the same plan as all of recent construction at that*



establishment. The leading objects I had in view, in the general arrangement of the plan of the engine, did not contemplate any improvement in the power over those heretofore constructed by Stephenson & Co.; but to make an engine that would be better adapted to railroads of less strength than are common in England; that would travel with more ease to itself, and to the rail on curve roads—that would be less affected by inequalities in the rail—than is attained by the arrangement in the most approved engines.

“You are aware of the fact that the Saratoga and Schenectady rail is constructed of timber capped with an iron plate. This kind of road cannot be expected to bear as heavy weight on the wheels of its carriages, as those that have an entire iron rail; and in order to obtain that degree of power which is desirable for an engine intended for high speed, it became an object to put the weight on six wheels, instead of four. Engines mounted on six wheels were constructed several years ago in England. The object was to distribute the weight on more points, to make them easier for the road than the four-wheel engines; for even with the iron rail the heavier carriage is injurious to the road. There was a difficulty, however, in the practical operation on the plan adopted. The load was found to bear at times very unequally on different wheels, owing to the inequalities of the road; and having all the wheels under one frame they did not work as well on curved roads as the four-wheeled engines, which could be geared much shorter. In consequence mainly of these difficulties, the six-wheel engines were abandoned, and I believe no attempt has since been made in England to use more than four wheels.

“In the Saratoga Engine I have adopted two distinct frames. One frame embraces four wheels in the same manner as a common waggon; these wheels are small, (thirty-two inches) in diameter, and of uniform size; one end of the second frame is mounted on the third pair of wheels, and the other end is rested on friction rollers in the centre of the first frame, to which it is secured by a strong centre pin. The small wheels, with their frame, work on the road the same as an independent waggon; and being geared short they go round a curve with as much ease as a common waggon; and being the leaders, they bring round the working wheels and the large frame on which the whole machinery of the engine rests, with as much ease as practicable. By this method it will be seen, the engine may pass a curve with the same ease as a common railroad carriage, having the same weight on the wheels. The machinery of the engine is not affected by the curve motion of the carriage. In order to give the four-wheeled engine carriage as much facility as practicable in turning curves, the wheels have generally been placed near together, bringing the bracing points of the frame so near the centre, in a longitudinal direction, as to cause the inequalities of the rail to produce increased motion at the ends of the frame, and consequently to the engine and boiler, which was connected with it. This, in the English engine belonging to the Mohawk and Hudson Company, was such as to render the motion very unfavorable to the engine, and severe on the road. By allowing the bearing points to be near the ends of the large frame, and resting one of these points on the centre of the small frame, as is done in the Saratoga engine, this difficulty is almost entirely remedied.

“The engine was set up in the shop of the Mohawk and Hudson Railroad Company, under the direction of Mr. Asa Whitney, the present Superintendent of that road, and who has, from its commencement, had charge of the machine shop connected with it. Thus far, the engine appears to do all that was anticipated from it. No test has yet been made of its power; but from the rapidity with which it generates steam, there appears no doubt of its performing all that it was calculated to do. It passes a curve without any more appearance of labor than a well-geared common carriage. The principle of its arrangement does not admit of more strain coming on any one wheel than is assigned for its regular labor. The motion of the engine is highly satisfactory; it moves with almost as smooth and steady a motion as a stationary engine; it travels over the road in an elegant and graceful style.

"I made a plan for a six-wheeled engine for the Mohawk and Hudson Road, which was completed and in operation before I made the plan for the Saratoga engine. This engine proved satisfactory, so far as regarded the principle of a six-wheeled carriage, and was an important pioneer for the second plan. The superior ease with which this engine moved, both for its own machinery and the road, led to the determination to alter the English engine on the Mohawk Road, so that it could be placed on a six-wheeled carriage. As the engine was particularly arranged for four wheels, this could not be conveniently done in any other way than by communicating the power through the intervention of a bell crank, which was very successfully done by Mr. Whitney. This engine is now working on six wheels; and the ease and smoothness of her motion over that she had when on four wheels, is very striking.

"The arrangement on six wheels does not admit of the wheels under the main frame being connected with those under the small frame; consequently we can only obtain the adhesion of one pair of wheels. This, however, is of hardly any importance when high speed is wanted.

"Should further experience confirm what the operations thus far appear to warrant, the plan of the Saratoga engine may be viewed as a valuable improvement. She has used for fuel a coke of inferior quality, made in New York, with which she has worked very well.

Yours, &c.,

J. B. JERVIS."

"Albany, 18th July, 1833."

To the sixth special interrogatory, he saith:

6. The principle of the locomotive I have described (that is, the truck principle, as it is usually called) has been generally adopted in the locomotives used in this country, so far as I have seen and been informed. On the New York roads they were adopted immediately after the result of the experiment, and gradually extended to the most locomotives in this country, with no material deviation in the main principle.

To the seventh special interrogatory, he saith:

7. I do not know that I could now find any original drawings of the engine or the bearing carriage. But a drawing of those now in general use would be substantially correct.

To the eighth special interrogatory, he saith:

8. The truck, as adopted in the locomotive I have described, is essentially the same as that now generally adopted in eight-wheel cars. I can discover no new principle in its application to the support of the body of an eight-wheel car, that was not fully settled in its application to the locomotive. The duplication of trucks does not present to my mind any claim as an invention.

To the cross-interrogatories to him specially addressed on the part of the Plaintiff, this witness answers as follows:

[Special cross-interrogatories, page 794.]

To the first special cross-interrogatory, the witness saith:

1 X. The wheels of all railroad cars, under locomotives or ordinary cars, must slip more or less in passing curves, except so far as the conical form of the wheel tread provides for the difference in length between the inner and outer rail. In a simple car or truck the forward wheel, by its flange, must force the car into the line of curve, and bring the back pair of wheels in the truck around on the curve; and in the locomotive the truck-wheels must bring the driving wheels into line,

so far as this may not be done by the conical face of the wheels, as above mentioned. The force to bring the driving wheels into the line of curve, is, no doubt, a tax on the guiding power of the truck, to some extent.

To the second special cross-interrogatory, the witness saith :

2 X. This appears to me to be assumed in the answer to the first cross-interrogatory. Friction will necessarily be increased when there is an increase of pressure.

To the third special cross-interrogatory, he saith :

3 X. I do not see that it does, as all axles in railroad cars must or should be rigid, and rest firmly in rigid frames. No such thing as flexibility in axles or frames can be allowed, either in the driving axles or the axles of a truck; and therefore I can comprehend nothing to compare with a rigid axle.

To the fourth special cross-interrogatory, he saith :

4 X. The supposition is hardly admissible for a locomotive—the machinery not permitting such arrangement. But the question may be regarded without reference to the action of the machinery for locomotion; and it then becomes a double car, or a car body resting on two trucks. In such case the forward truck has nothing to do with the hind truck, strictly speaking, in providing for its friction in getting round the curves; each truck, by its forward wheels, performs its own labor in passing round; in this case the forward truck has less to do, inasmuch as all the labor of changing the direction of the rear truck must be performed by itself. In such case it is the action of two trucks in passing a curve, instead of one truck, whose friction or labor is increased to bring the driving wheels into the line of curve.

To the fifth special cross-interrogatory, he saith :

5 X. No doubt there is a limit in the distance the driving wheels should be placed from the truck, to secure the best results. Placing them at double the usual distance apart, would not be as well on curves of any considerable sharpness. The driving wheels would, in such case, be urged on the curves too fast, and crowd the inside instead of the outside of the curve.

To the sixth special cross-interrogatory, he saith :

6 X. The most usual length of a locomotive is, I think, about twenty-three feet (I speak from recollection). The forward wheels of the truck are near the forward end of the machine, and the back drivers near the other end. It is an object to have them so long as will give sufficient frame for the engine, and not so as to tack too quick on the curve. I should think any length that would not bring the wheels, in passing curves, hard on the inner rail, would work well. The degree of curvature would affect this question; and on many roads, my impression is, that no great addition to the usual length would be advisable. Most engines have two pair of driving wheels—one pair placed before and the other behind the furnace, which distributes the weight very well—the wheels being from  $4\frac{1}{2}$  to 6 feet between their bearing points on the rail. The wheels in the truck are usually from 4 feet to 4 feet 9 inches between centres or bearing points on the rail. This arrangement spreads the bearing points, and gives eight points to support the engine, and is, I think, a good method to relieve the rail from too great or too much concentration of weight. Within proper limits it



is important to distribute the pressure of the weight of locomotives, which has been the main object in contrivances to increase the number of wheels, and to place them so far apart that the weight of one wheel should not affect the rail at the point of bearing of those nearest in proximity.

To the direct interrogatories on the part of the Respondents, addressed to the witnesses generally, this witness answers as follows :

[Interrogatories, page 649.]

To the first interrogatory, he saith :

1. I have answered this question in my answer to the first special direct interrogatory.

To the second interrogatory, he saith :

2. This is answered in the answer to the second special direct interrogatory.

To the third interrogatory, he saith :

3. I am familiar with the mechanical principles of the construction and operation of the eight-wheel cars, now in general use on the railroads in the United States.

To the fourth interrogatory, he saith :

4. I have examined a copy of said specification.

To the fifth interrogatory, he saith :

5. I have. It is essentially a true representation of the car described and recommended in said specification. I should construct just such a car from the description, except that the specification gives no diameter for wheels; on this the mechanic must exercise his own judgment.

To the sixth interrogatory, he saith :

6. First, to have a firm rigid truck, to hold the axles parallel and the wheels square. The bearing points of the wheels about as far apart as the width of the track. To have the truck turn or swivel under the body, so that it can conform with the facility of an independent car, to all the curves and inequalities of the road. Side bearings, to prevent the body from rocking, and to hold the trucks steady, so that the car will run smoothly and evenly. The trucks must be placed near the ends of the body, or a sufficient distance apart to allow them to turn without interfering with each other.

To the seventh interrogatory, he saith :

7. The cars now in general use have a variety of improvements not enumerated in the specification of Winans. Some of these are important, and go far towards making passenger cars what they are—well adapted to the transportation of passengers in the most comfortable and rapid manner. Among these improvements are brakes, draw springs, swinging bolsters, side-bearings, body as well as side springs, changeable backs to seats, &c. &c. Others might be enumerated.

To the eighth interrogatory, he saith :

8. The bodies of the eight-wheel cars can be removed from the trucks whenever it is desirable, by taking out the king-bolt and raising the body. The trucks are placed from five to seven feet from the ends of the body, as a general thing.

To the ninth interrogatory, he saith :

9. The cars now in use invariably have side bearings; and they are



necessary to prevent the rocking or oscillation of the body in passing curves and the inequalities of the road, and give general steadiness and ease of motion of the car.

To the tenth interrogatory, he saith :

10. Check chains are generally used, and prevent the trucks from turning round when the car is thrown from the track.

To the eleventh interrogatory, he saith :

11. Increasing or diminishing the length of the body, so long as the trucks are placed at the same distance from the ends, does not introduce any new or different mechanical principles into the organization of the car ; nor does such change require any exercise of invention. It would be a change of proportion, but not of mechanical principles. There is, however, a practical limit to the length of a car in its operation on a road.

To the twelfth interrogatory, he saith :

12. I do not consider a truck with the wheels so connected, practically reliable. It would be too flexible to maintain parallelism and to be kept on the track ; and if the springs should break, as it would be very likely to do, from the wrenches and side lurches the truck would be subjected to, the consequences to passengers would be hazardous. The sudden application of the breaks to the wheel would be very likely to break the spring at its weakest point, where it is bolted on to the upper sides of the boxes. I should not be willing to run a car with the wheels in each truck so connected, on a road over which I had any control. It would not, in my opinion, be safe.

To the thirteenth interrogatory, he saith :

13. I have examined the drawing ; and find that it is not constructed in its running gear as recommended in Winans's specification. It has a strong truck, and the axles are held firmly in their place. Two springs are shown on each side of the truck-frame, while only one, and that used in an essentially different way, is recommended in the specification. These two springs have the shorter beams downward, while the reverse is recommended on the long spring. In the drawing, the bolsters holding the body are placed several feet from the ends of the body, while the specification says they may be placed so far without the body of the car, at either end, as to allow the latter to hang down between the two sets of wheels or trucks. There are other differences which I do not consider it necessary now to mention.

To the fourteenth interrogatory, he saith :

14. I have seen and examined copies of the work referred to, being the extracts appended to this commission, including the drawings.

To the fifteenth interrogatory, he saith :

15. I have ; and find that it does contain and truly represent an eight-wheel car, described by Chapman. The drawing shows, and the specification speaks of, a six-wheel car, having one swiveling truck, with side bearings ; and the specification says that, by removing the two wheels, and substituting a four-wheel truck, like the one under the other end, attached to the body by a king-bolt, an eight-wheel car is complete ; and such is the car represented by model K.

To the sixteenth interrogatory, he saith :

16. I think he would. The truck and its manner of connexion with the body, by a king-bolt or transom, with side bearings, contains the

same principles as those of the eight-wheel cars of this day in general use. It has a rigid frame, with bolsters, one on the truck and the other on the body, held together by the king-bolt, which allows both truck and body to swivel freely. The bearing points of the wheels are about as far apart as the width of the track.

To the seventeenth interrogatory, he saith :

17. It has all of these, regarding the pivot the same as a king-bolt; being used for that purpose.

To the eighteenth interrogatory, he saith :

18. By measurement it is.

To the nineteenth interrogatory, he saith :

19. It may, by substituting a single pair of wheels in place of one of the trucks; and this change is sufficiently described in Chapman's specification, to enable a good mechanic to make it, without exercising invention.

To the twentieth interrogatory, he saith :

20. I have examined a copy of said work; and find a drawing and description of a double-truck eight-wheel railroad car. I have had the work in my possession over twenty years.

To the twenty-first interrogatory, he saith :

21. This car shows a body double the usual length of a four-wheel car. It has two four-wheel trucks, each one having four wheels, which are placed in a rigid rectangular frame. On the centre of these trucks is a bolster, with a cylinder or hole in the centre, through which the king-bolt passes. These trucks are placed one under each end of the body, some few feet from the ends, so that the trucks would not be interfered with when run in a train with other cars. The mode of attachment is by a bolster on or near, say some five feet distant from, each end of the body, which rests on a similar bolster in the centre of the truck, with a hole through the middle for the king-bolt. The bearing is around the king-bolt, and the trucks swivel on the king-bolt, and are allowed to turn, so as to conform to the curves, depressions and elevations of the road. This swiveling of the trucks allows them to pass obstructions, and go over unsmooth places in the track of the road, without communicating the shocks to the body, except in a very slight degree. This centre-bearing and king-bolt connection with the body, also, distributes the weight of the load equally among the wheels, as described by Tredgold. The bearing points of the wheels in each truck are about as far apart as the gauge of the track, on cars used on the roads throughout the United States. The trucks are placed sufficiently remote from each other, under the body, to prevent their being brought into contact when turning or swiveling. The car described by Tredgold differs from the Chapman car, in respect to the bearings of the body on the trucks or bolsters. Chapman had more centre surface for the body to rest on, and, in addition, has side bearings. In other respects they are alike—both swiveling cars. The drawing is a skeleton, but clearly indicates the principle of an eight-wheel car, formed by two distinct cars, on which a long body is supported, in a manner that admits the two bearing cars to act freely and independently of each other.

To the twenty-second interrogatory, he saith :

22. I have examined model A. It is a correct representation of the car shown and described, in every particular. I have also examined

model C, and see no resemblance between that and the one shown and described by Tredgold. It could not run on a railroad; it would not turn to conform to the sinuosities of the road. It would not distribute the weight of the body among the wheels; in short, it would not perform any of the indispensable requisites of a car for railroads.

To the twenty-third interrogatory, he saith:

23. I consider the mechanical principles substantially the same. One has side bearings, the other not.

To the twenty-fourth interrogatory, he saith:

24. I think it is calculated to answer the purposes and objects set forth in Winans's specification. Its principle of operation is the same.

To the twenty-fifth interrogatory, he saith:

25. I have seen the letters patent of Fairlamb, with the drawing; and there find represented an eight-wheel swiveling car, with two four-wheel trucks placed remotely from each other, and one under and near each end of the frame or body. The wheels in each truck are nearer together than those in common use on cars, but are more distant than recommended by Winans. The body is sustained upon a round transom plate, showing more bearing surface than Winans describes. The axles are allowed to slide in a socket in passing curves, so that the wheels might be expanded or contracted. Winans may have intended to accomplish the same purpose by his flexible trucks, or long spring connection of the wheels in each truck. The substantial features of arranging the body with the trucks is the same as Winans's.

To the twenty-sixth interrogatory, he saith:

26. I think he would; and that the car would embody the essential principles of an eight-wheel car, such as now used; and that it would accomplish all the beneficial results claimed by Winans in his patent, with the exception of his sliding axle, which I do not believe to be practicable.

To the twenty-seventh interrogatory, he saith:

27. I have examined the drawings of Allen's steam carriage or car, marked G and H. I will describe it in Mr. Allen's own language. "The ground plan, letter O, shows the vertical centre pivot in the middle of the truck or bolster, on which pivot the truck turned under the body, to follow the curves and turnouts. In the end view, letter I, is the same vertical pivot shown, secured to the middle of the same bolsters, by a nut on its stern, which extends down through the bolster; and the same view also shows the upper bolsters supporting the boilers or body of the carriage, and having this vertical pivot I through it, that the truck may turn under it, and conform to all the inequalities of the road. The letter P, on the side view, shows one of the side bearing friction rollers, of which there were two to each body bolster, one on each side of the middle of the vertical pivot O. These four-wheel trucks were made of very strong timber, of the rectangular form, as shown by the drawing, and had pedestals and springs to the boxes of the wheel axles, as shown, which caused the wheels to act perpendicular to the track, held the axles parallel to each other and the wheels square in running, both on the straight and curved lines and turnouts of the road. Two of these trucks, both alike, supported the body and acted independently of each other, conforming to the curves and turnouts and all the other irregularities of the road, and causing an ease of motion to

the carriage, which was so steady in comparison to the four-wheel cars, that often when I have wished to write a note or order, to leave along the line, I have left the four-wheel cars and gone on those eight-wheel steam carriages, and written there."

The mechanical structure of the car, and its principle of operation, is well calculated to make it accomplish all that Winans claimed in his specification. The swiveling part of Winans's car is contained in this. Allen's is much the most perfect and practical car, and is precisely like the cars now in general use, as regards the truck and its mode of connection with the body. The side bearings are now universally used on eight-wheel cars, so far as my knowledge extends.

To the twenty-eighth interrogatory, he saith :

28. I have examined said model, marked "G. Bryant." It has two rigid rectangular truck-frames, which hold the two axles firmly parallel to each other. One of them is placed under each end of the platform of the body. Each truck has a centre bolster and side bearings. A king-bolt passes through a bolster, from the frame or body which rests on the bolster in the truck, and passes through that also. By means of this king-bolt connection, the trucks are allowed to swivel freely and the body turn to conform to the curves and turnouts of a railroad. Its operation is the same as the cars now in general use. It will perform all that is required of an eight-wheel car in its essential mechanism of an eight-wheel car.

To the twenty-ninth interrogatory, he saith :

29. The Bryant car contains the essential mechanical elements to make a car run smoothly and desirably on a railroad, that are described by Winans. There are differences between this and the one described in the patent, some of which are essential ; such, for instance, as the mode of making the trucks, and connecting the wheels in them, and in side bearings. Both are swiveling trucks, and the connection of the body with the trucks by a king-bolt is the same.

To the thirtieth interrogatory, he saith :

30. There cannot, I think, be a question but what a mechanic, with the Bryant car before him, could, in 1829, have constructed an eight-wheel double-truck car, substantially like those in general use at this time.

To the thirty-first interrogatory, he saith :

31. I have. Tredgold was published in 1825. The mode of draft from the end of the body is clearly shown in those works, and was understood at that time by me.

To the thirty-second interrogatory, he saith :

32. I find the distance of the bearing points of the wheels in cars, shown on plates in Strickland, to be about the same distance apart as those used on the cars now in general use.

To the thirty-third interrogatory, he saith :

33. They were ; in the English edition of Wood, of 1831, and in Allen's carriage.

To the thirty-fourth interrogatory, he saith :

34. It was. Both modes were well known, and each had its advantages.

To the thirty-fifth interrogatory, he saith :



35. It would not. All would be changes of form for specific objects, without involving any mechanical principles of invention.

To the thirty-sixth interrogatory, he saith :

36. The distance of the flanges from each other is entirely immaterial, for it may be varied by a change of the size of the wheels. The distance of the bearing points of the wheels is essential. If wheels of twenty inch diameter were used, with the flanges near together as they could be without touching, the trucks would be unsteady, and its action so near like a single pair of wheels that the parallelism of the truck or bearing car could not be maintained, and it could not be kept on the track when out of square, with any considerable speed. It would wobble so much that the car would not run smoothly and evenly, nor would it be safe to use on a road.

To the thirty-seventh interrogatory, he saith :

37. It is material to make the trucks run steady on the curves and straight track. The action of the trucks upon the rails and the reaction of the rails upon the truck is communicated through the bearing points of the wheels and their flanges ; hence the importance of having those bearing points of the wheels a proper distance apart. Another important reason for spreading the wheels in each truck apart is, to distribute the weight of the load over a greater surface of rail, and in this way prevent the injury to the rails and the depressing of the ties.

To the thirty-eighth interrogatory, he saith :

38. It is. A flexible truck, with the axles not held in a uniform distance apart, would not be safe on a railroad, at high rates of speed. If in coming in contact with obstructions or depressions on a road, the forward wheels in a truck were not held to their place by a rigid frame, they would cramp and be off the track. The truck would be liable to be wrenched out of square, and rendered unfit for use. This all my experience proves. Nothing is more indispensable to the safe working of a car, than a rigid frame kept in perfect parallelism.

To the thirty-ninth interrogatory, he saith :

39. I have known Mr. Winans for a long time, but I never heard of his having a patent for an eight-wheel car until some time in 1845 or 1846, some time after the eight-wheel cars were in general use on railroads. The first claim I heard of his making upon railroads for the infringement of his patent, was the suit against the Schenectady and Troy Railroad, some time in 1847, I believe ; nor had I then seen any publication in regard to his patent.

To the fortieth interrogatory, he saith :

40. I do not think his theory correct, by any means. Experience has fully shown its fallacy. A car with the wheels in each truck so near together as to make their action resemble that of a single pair of wheels, would not do to run upon a railroad, for the reasons stated in my previous answers. The truck would be too unsteady, and have too much of a zigzag motion. The connection of the wheels by a long spring, as described by Winans, would be (as I think) quite unsafe, and could not be carried out in practice. His recommendation of bearing the whole load on the centre of the bolster, without side bearings, is wrong, as my experience has fully demonstrated. It would allow the body too much rocking and tipping, first on one side and then on the

other, in passing curves, and also in passing inequalities on the straight road, at high velocities. A car like the one recommended by Winans, could not be used on railroads at the present day of high rates of speed; and I have never seen one of them in use, nor do I believe that any railroad company could be induced to use them.

To the cross-interrogatories on the part of the Plaintiff, the witness answers as follows:

[Cross-interrogatories, page 654.]

To the first cross-interrogatory, he saith:

1 X. I have answered this question, I think, in my answer to the second special direct interrogatory.

To the second cross-interrogatory, he saith:

2 X. As a civil engineer, I have given a good deal of attention to machinery, and specially to railroad cars. I designed the truck, or separate bearing carriage, for a locomotive engine, and put the same into successful operation, in the years 1831 and 1832.

To the third cross-interrogatory, he saith:

3 X. I have been, in two or three instances; on the subject of machinery and railroad cars.

To the fourth cross-interrogatory, he saith:

4 X. I have been so accustomed, to a considerable extent.

To the fifth cross-interrogatory, he saith:

5 X. It has.

To the sixth cross-interrogatory, he saith:

6 X. I have had study and experience, and think I am well acquainted, both theoretically and practically, with railroad engineering, and understand the principles involved in the construction and operation of railroad cars generally. I can compare the different modes of construction, and believe myself competent to judge of their practicability.

To the seventh cross-interrogatory, he saith:

7 X. It is important to avoid all friction possible between the flanges of the wheels and the rails, provided it does not involve injury in other respects.

To the eighth cross-interrogatory, he saith:

8 X. It will.

To the ninth cross-interrogatory, he saith:

9 X. I think they will not. There is a limit to the distance between the wheels of a truck or railroad car. It should not be too great, nor too small. If too great, (the wheels being in a rigid frame,) the forward wheel on one side drives the rail and the hind wheel on the other side; and this may be carried to a point that would render the running of the car impracticable. If too close together, the frame will be too much strained to maintain its square or parallelism; and when this is lost, even in a small degree, there is no safety in the running. The motion, also, when too close geared, is unsteady, wobbling from side to side,—specially bad on straight road, and always more liable to leave the track. Instead of placing the wheels as close together as possible, and the closer the better, as recommended by Winans, my experience and observation shows that the distance between the forward and hind wheels of a truck should be about equal to the width of the road gauge, provided

that did not exceed 5 feet, perhaps a little less. On the 4 feet 8½ inch gauge, I have noticed that they were from 4 feet 2 inches to 4 feet 6 inches. I think 4 feet 4 is quite as near as is good for steady and safe running for passenger cars. In some cases with four-wheel cars, at an early period, the wheels were placed further apart; but this was to accommodate bodies to carry bulky articles, so as to give more room or surface for the body to rest on than is necessary in the truck of an eight-wheel car. In the English cars I have often measured this feature, and found them 6 to 7 feet generally. The English think our truck, as we use it generally, too short-g geared for safety.

To the tenth cross-interrogatory, he saith :

10 X. They will not. Too much freedom is not desirable, as any one can see by riding in different cars in a train. The trucks in the back car have the most freedom, and that car runs the least steady of any in the train. Trucks want something to steady them on the track, to prevent too much wobbling. Side bearings have a tendency to steady a truck, more or less. The wheels of a truck, when too much freedom is given them, and more particularly when the wheels are very near together, are constantly coming in contact with the rail, much to the injury of the road and car and safety of the load transported. There is required a certain play in the flanges; and if the car is too short geared, this allows the flange to strike the rail.

To the eleventh cross-interrogatory, he saith :

11 X. I am; and have previously stated my means of knowledge—being study, observation and experience.

To the twelfth cross-interrogatory, he saith :

12 X. It is not. The four-wheel car, as used in England at this time, (the bodies being coupled together by a right and left screw, which is screwed up hard, making a stiff connection, with spring bumpers on each corner of the body,) run as steadily as the eight-wheel cars, and are drawn at as high velocities. I have myself rode in them at the rate of fifty miles per hour. But without such connections by screws and couplings, the four-wheel car would not be as steady as the eight-wheel car. Resting the body on the middle of the bearing car, it would feel the inequalities of the rail less than if it oscillated beyond the bearings on the axles, as was found to be the case with the first engines, where the end was supported on a truck or bearing car, instead of one pair of wheels. Precisely the same as with a person sitting in the middle of a common waggon; he feels the motion much less than if his seat was placed at the end beyond the wheels.

I do not understand what is meant by "great length." There is a proper limit to a car body. They should be neither too long or too short, and one hundred feet would be too great a length. Long-bodied cars should be supported near the ends, for various reasons. The great length of body, and support at or near the ends, are not the only features, by any means, that produce steadiness of motion in cars. The force of shocks from the trucks pass off through the king-bolt, before reaching the body, and this shock, whatever it is, is felt less in a very long than it would be in a very short body. The connection has much to do with the ease of motion of cars.

To the thirteenth cross-interrogatory, he saith :

13 X. It is.

To the fourteenth cross-interrogatory, he saith :

14 X. It is not important.

To the fifteenth cross-interrogatory, he saith :

15 X. It is not. It would not be convenient to draw by the trucks in an eight-wheel car. Their position is not favorable to it. If the draft could conveniently be applied to the trucks, as there are so many cars in a train, the force of traction would tend to aid, rather than injure their progress on a curve.

To the sixteenth cross-interrogatory, he saith :

16 X. I think it does substantially, although there appears more surface bearing shown in the drawing than is described in the specification.

To the seventeenth cross-interrogatory, he saith :

17 X. The model shows no mode of draft, and I see none mentioned in the specification. The drawing does.

To the eighteenth cross-interrogatory, he saith :

18 X. There is no particular form of spring described and recommended by Winans, and no particular mode of truck, which he seemed to think formed an essential part of his invention ; but it is in some measure indefinite, as no mention is made of the size of the wheel, without which it is impossible to say how near he intended to place his axles.

To the nineteenth cross-interrogatory, he saith :

19 X. I do consider springs important in cars. They are more comfortable for passengers, and prevent destruction to car and road. They have been used on railroad cars from their earliest introduction to this time for passenger traffic. They are clearly shown in the Allen car, with pedestals. They might be applied to the Bryant, the Chapman, or the Tredgold car, without inventive powers. The manner of application was well known previous to 1829 or 1830.

To the twentieth cross-interrogatory, he saith :

20 X. It does. The drawing, plate V, volume XXIV, figure VIII, shows the six-wheel car, and that part of the specification on page 139, referring to figure VIII, clearly describes the requisite change to make an eight-wheel car. The draft, it appears, was applied through the body.

To the twenty-first cross-interrogatory, he saith :

21 X. There is nothing in the drawing or description of Tredgold, showing the link in the end of the body.

To the twenty-second cross-interrogatory, he saith :

22 X. There is. Fig. 26, plate IV, shows the vertical king-bolt or axis, for the wheel frame or truck to swivel to curves as it runs on the road ; also in mechanics, the words on page 94, "the body must be sustained so that its pressure may be divided equally among the wheels." "In the case where eight-wheels are applied to support one body, if the body rests upon the wheel-frame of each set of four wheels, in the middle of its length, (see fig. 26, plate IV,) and is connected with those frames, so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure." These words necessarily describe and require the ordinary wheel-frame and axis, known at that time and described by Chapman, without Chapman's side bearings, but with a central bear-



ing alone, as shown in the drawing of Tredgold; which, among other things, allows the frames or trucks to swivel laterally to the curves of the rails. Also, on page 179, the words, "the body of the waggon rests on the wheel-frames at A A, and is connected to them by an axis, on which the frames turn, when from any inequality the axes of the wheels are not in the same plane."

To the twenty-third cross-interrogatory, he saith :

23 X. The king-bolt connection, so as to allow the trucks to swivel and the body turn, is the same. Both have the trucks near the end of the body, although Winans says they may be placed at the end of the body, so that it will hang down between the trucks. The objects and purposes of the arrangement and connection of the body with the trucks, was the same in Allen's as in Winans's. In truck frames, spring pedestals and side bearings, they vary; and the variation is materially in favor of Allen's car.

To the twenty-fourth cross-interrogatory, he saith :

24 X. I have answered this in my answer to the twenty-ninth direct interrogatory.

To the twenty-fifth cross-interrogatory, he saith :

25 X. I think he would. He could have obtained models from Chapman, Tredgold and Bryant. The plan of those cars would have furnished him knowledge by which he would be enabled to construct cars that would run at that rate of speed. I think nothing in Winans's specification would have added to his stock of knowledge, if he had seen the cars, descriptions and drawings above referred to. Allen's car was about 1830, as near as I recollect—not before. These sources of knowledge would have given every essential principle that is required for an eight-wheel car.

To the twenty-sixth cross-interrogatory, he saith :

26 X. The principle would be the same. I have known them made both ways.

To the twenty-seventh cross-interrogatory, he saith :

27 X. I have understood it was applied to the truck.

To the twenty-eighth cross-interrogatory, he saith :

28 X. I do not; each mode has its advantages, depending on circumstances.

To the twenty-ninth cross-interrogatory, he saith :

29 X. They were.

To the thirtieth cross-interrogatory, he saith :

30 X. It has not. Chapman's car is an instance to the contrary.

To the thirty-first cross-interrogatory, he saith :

31 X. They would not, except so far as might be inferred by their drawings and cars, as indicating the proper distance. Placing the wheels too close together does not reduce the friction between the flanges of the wheels and the rails, in going round curves.

To the thirty-second cross-interrogatory, he saith :

32 X. Great length of body, supported at or near each end, upon two trucks, with the wheels very close together, I do not think gives great steadiness of motion, of itself, to cars running at high velocities.

To the thirty-third cross-interrogatory, he saith :

33 X. I have answered this question. Trucks must not have the greatest possible freedom. Too much freedom renders them more liable

to get off the track, and makes them more unsafe. In cars where the draft can be applied to the truck or bearing car, I regard it as calculated to guard the car from leaving the track.

To the thirty-fourth cross-interrogatory, he saith :

34 X. The Bryant car, Allen car, and Chapman car, are all well adapted to run at high velocities, and I think better calculated to do so than the one described by Winans.

To the thirty-fifth cross-interrogatory, he saith :

35 X. The purpose of all these cars was to run on railroads ; and Mr. Allen particularly says, his object was to have the car run smoothly, and with less injury to the road ; and so also Mr. Bryant says. They possessed all the requisites of ease of motion, and at the same time properly distributed the weight among the wheels. They were all swiveling trucks, rigid and strong wheel-frames, and all but Tredgold's had side bearings. Mr. Allen, in his testimony in the case of *Winans vs. Eaton, Gilbert & Co.*, says : "The whole of these eight-wheel steam carriages, as drawn and shown in an organized form, in Charleston, in the winter of 1830 and '31, and afterwards constructed and put upon the road, contained and operated upon the same substantial combination of two four-wheel bearing carriages, with rigid rectangular frames and pedestals and springs, bolsters and centre pivots and side bearings, supporting a long body, and conforming to the curves and other inequalities of the road, as the eight-wheeled passenger and freight carriages now extensively used on the railroads of this country. There is no difference whatever in the substantial character of the construction and operation of the combination, to enable the carriage to move with ease and safety on the road, and conform to the curves, turn-outs, and other inequalities. Putting a passenger car body on the bolsters of the steam carriage, instead of the boiler, would form what is called a passenger carriage ; but in my opinion, the combination, in its substantial character, would be the same. It would not be the invention of a new combination, but would be still the same principle, operating in the same manner, and producing only the same results of safety, and ease of motion to the body carried, and benefits to the road, as distinguished from either four-wheeled passenger or steam carriages." From the combination of this carriage, I should think it would run very smoothly, as much so as represented by Mr. Allen.

To the thirty-sixth cross-interrogatory, he saith :

36 X. I cannot say.

To the thirty-seventh cross-interrogatory, he saith :

37 X. I have not.

To the thirty-eighth cross-interrogatory, he saith :

38 X. I am connected with the Southern Michigan Railroad, as President. They use the eight-wheel cars.

To the thirty-ninth cross-interrogatory, he saith :

39 X. I certainly think there is not the originality and invention that should give validity to his patent. When informed—and before I saw his patent—that he claimed such an invention, I considered every essential principle of an eight-wheel car to have been fully settled before his patent was granted, or, so far as I know, thought of by Winans.

To the fortieth cross-interrogatory, he saith :

40 X. I belong to no railroad association—have had no intercourse with counsel, nor aided in this suit.

To the forty-first cross-interrogatory, he saith :

41 X. I have been shown these interrogatories by the Commissioner taking my testimony at the time ; otherwise I have not.

To the further direct interrogatories on the part of the Respondents, this witness answers as follows :

[Further direct interrogatories, page 659.]

To the first further interrogatory, he saith :

1. Eight-wheeled cars were made for some years before I heard of any patent relating to them, on different roads, without claim or objection from him, so far as I know.

To the second further interrogatory, he saith :

2. I think it would not.

To the third further interrogatory, he saith :

3. It would not.

To the fourth further interrogatory, he saith :

4. There is not. If the two trucks were separated double the distance represented, the mechanical principles of construction and action of the car would not be changed.

To the fifth further interrogatory, he saith :

5. I would give the same answer as last above.

To the sixth further interrogatory, he saith :

6. I would also answer this question in the same way. Taking off the steam engine and putting on a body sixty feet in length, with a truck near each end, as shown in the drawing, or taking off the driving wheels and putting on those of a smaller size, would not change the principle or action of the car in the least. A mechanic would see this at a glance, and if the change had been necessary, would have made it without the aid of invention.

To the seventh further interrogatory, he saith :

7. It would not.

To the eighth further interrogatory, he saith :

8. There is an essential difference in the arrangement of the wheels ; but both use the king-bolt, and both are swiveling trucks, placed near the ends of the body. But the cars in general use differ in the body not resting entirely on the king-bolt. They have side bearings, and more bearing surface for the body to rest on. I have never seen a car that would conform to Winans's specification.

To the ninth further interrogatory, he saith :

9. It is not. The specification of Winans calls for a body only twice the length of the ordinary four-wheel bodies, which were from ten to fourteen feet long, as a general thing. The coal cars were shorter than this.

To the tenth further interrogatory, he saith :

10. It is not necessary, for the reasons I have stated in my former answers.

To the further cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

[Further cross-interrogatories, page 660.]

To the first further cross-interrogatory, he saith :

1 X. The theory of Winans was—close proximity of wheels in each truck, so close that they should act like a single pair; the connection of the axles in each truck by a long spring fastened to the ends of the boxes by a bolt, making a flexible rather than a rigid truck, and only centre bearing around the king-bolt. The theory was, that trucks so constructed, and arranged under the ends of a body, would relieve the car from shocks, concussions, and lateral vibrations, and make it run smoothly and evenly. But experience has shown that this theory is unsound; and a car arranged in accordance with it, would be unsafe for use, and hence, I suppose, the reason it is not used.

To the second further cross-interrogatory, he saith :

2 X. The speed at that time, like the present, varied very much. 25 miles per hour had been attained about that time. They were used for all purposes requiring transportation, according to their situation.

To the third further cross-interrogatory, he saith :

3 X. They were, and they are so constructed now. Distribution rather than concentration of the weight of cars and locomotives, is very important in railroad economy.

To the fourth further cross-interrogatory, he saith :

4 X. There were two. Stockton and Darlington, and Liverpool and Manchester.

To the fifth further cross-interrogatory, he saith :

5 X. Steam power was used previous to that time.

To the sixth further cross-interrogatory, he saith :

6 X. I cannot say what the average rate of speed was; but I think it was greater than six miles per hour.

To the seventh further cross-interrogatory, he saith :

7 X. I have. I cannot give dates. I have had much to do in directions of designs for cars and their parts, more or less, for twenty years.

JOHN B. JERVIS.

Subscribed and sworn before me, this Dec. 2, 1853.

JOS. F. SABINE, *Com'r, &c.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 1st and 2d days of December, A. D. 1853, John B. Jervis, of the city, county and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my chambers in St. Nicholas Hotel, in the city of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of the said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me before signing, and was then subscribed by the said witness.



Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 2d day of December, A. D. 1853.

JOS. F. SABINE, *Comr.*

## DEPOSITION OF GEORGE BEACH.

George Beach, a witness, being duly sworn, to the interrogatories on the part of the Respondents, answers as follows :

[Interrogatories, page 649.]

To the first interrogatory, the witness saith :

1. My name is George Beach ; age forty-one years ; place of business and residence, Troy, New York ; and occupation, car-builder.

To the second interrogatory, the witness saith :

2. I have for nineteen years been engaged in car building, and am familiar with the theory and practical operation of railroad cars.

To the third interrogatory, the witness saith :

3. I am familiar with the mechanical principles of the operation and construction of the double-truck eight-wheel railroad cars now in general use.

To the fourth interrogatory, the witness saith :

4. I have examined the specification of Ross Winans, a copy of which is shown to me by the Commissioner.

To the fifth interrogatory, the witness saith :

5. I have examined the model B, now shown to me by the Commissioner. It is a correct representation of the car described by Winans in his specification, and just such a one as I should build from it.

To the sixth interrogatory, the witness saith :

6. The essential and elemental parts of an eight-wheel double-truck railroad car are : two trucks made rigid and stout, well braced to keep them from being wrenched or twisted out of square ; and they must be connected with the body by a king-bolt, in order to allow the trucks to swivel and turn under the same, and conform to all the curvatures and inequalities of the road. The trucks must be attached within from five to seven feet of each end of the body, so that they can be run in a train without the trucks coming in contact with those in an adjoining car, and the trucks must be sufficiently remote from each other to allow them to swivel or turn without any two trucks coming in contact with each other. The body should rest on the centre circle around the king-bolt and side bearings. This gives steadiness to the body when the car is in motion, and prevents the oscillation or rocking of the body. The wheels in each truck must be about as far apart, from centre to centre, as the width of the track, and the axles must be held parallel, and the wheels square. I have built cars with the flanges of the wheels twenty-seven inches apart, and when the wheels are placed thus far apart, the car runs more steadily on the straight track, and the outer front wheel in each truck does not bind, or bear too hard against the outer rail, and runs easy also on the curves as well as on the straight track.

To the seventh interrogatory, the witness saith :

7. They have a great number. Imlay's centre circle, the swinging bolster, side bearings; pedestals with springs; spring bumpers; solid hub and chilled rim wheels; and many others.

To the eighth interrogatory, the witness saith :

8. They are.

To the ninth interrogatory, the witness saith :

9. They do; for the reasons stated in the answer to the sixth interrogatory.

To the tenth interrogatory, the witness saith :

10. They are to prevent the trucks from turning round when they are thrown off the track.

To the eleventh interrogatory, the witness saith :

11. It does not. It is simply a change of proportion, which does not effect the mechanical principles of construction or operation.

To the twelfth interrogatory, the witness saith :

12. It would be impracticable, in my judgment. The truck would be too elastic to keep it in its place, or square; and there is no means of applying anything to steady the action of the springs, and confine them perpendicular to the track; and there is no means of preventing the leaves of the springs from spreading out like a fan, from the side pressure against the wheels; and nothing in the construction of the truck described, to resist a blow from any obstruction on one side of the road, or a short curve, or prevent the truck from twisting out of shape. It is not safe and not practical for running on a railroad; it would not stay on the track; it would not be safe. The wheels of the trucks of an eight-wheel car must not be as close together, in each truck, as they can be placed without the flanges touching; as they would, (if they were thus close,) wobble about on the straight track, injure the road, and not be as safe as wheels or trucks with wheels as far apart as they can be placed, consistent with the radius of the shortest curves of the road. The wheels in each truck of the eight-wheel cars are generally placed from twenty to twenty-five inches apart.

To the thirteenth interrogatory, the witness saith :

13. I have examined said drawing, and find an essential difference between the running gear recommended in Winans's patent, and that under the car, as shown in the drawing. They differ in this respect: The wheels in the drawing have a rigid wood frame, made of sufficient strength to hold the axles parallel, and the wheels square. The wheels are not as near together as they can be without the flanges touching; they are sufficiently far apart to admit of brakes between the wheels. The trucks of the car in the drawing are not in the least like those described by Winans, in his specification. They are connected with the body in the manner recommended by Winans, by a king-bolt; but in all other respects they differ, and the difference is important.

To the fourteenth interrogatory, the witness saith :

14. I have examined a true copy, shown me by the Commissioner, of the specification and drawing of the patent of W. and E. W. Chapman, taken from the Repertory of Arts, published in London, in 1814.

To the fifteenth interrogatory, the witness saith :

15. I have examined model K, and think it truly represents a car

described and shown in said book, and just such a one as I should build from the drawing and specification.

To the sixteenth interrogatory, the witness saith :

16. I think he would. I have no doubt but I could build just such cars, substantially, as those now in general use, from the specification and drawings.

To the seventeenth interrogatory, the witness saith :

17. The Chapman car, as shown in the drawing, has side bearings, centre pivot, and rigid-wheel frames, that hold the axles firmly parallel with each other. It is a practical truck and car, resembling very closely those now in general use in the United States.

To the eighteenth interrogatory, the witness saith :

18. The bearing points of the wheels are distant apart the same as the width of the track, by measurement.

To the nineteenth interrogatory, the witness saith :

19. It may, by removing one truck, and putting in its place two wheels ; or removing the two wheels and substituting a truck, which is clearly described in the specification.

To the twentieth interrogatory, the witness saith :

20. I have examined "A Practical Treatise on Railroads and Carriages," by Thomas Tredgold, published in London, in 1825 ; and the plate IV, figure 26, and its description on pages 179 and 94, &c., clearly show an eight-wheel car, with long body and double trucks, and a proper framing for the wheels to run in, with an axis in the centre of each truck, and a cylinder base for the trucks to swivel or turn to the curves of the road, and also follow the straight track. The wheels in the trucks of the Tredgold car are a distance apart much less than the diameter of the wheels. I have measured them, and the distance of the wheels apart is the same, proportionate to the diameter, that I have built double truck eight-wheel cars in Rochester, for the Rochester and Tonawanda Railroad ; and they were practically used on that road ; that is, a distance of 27 inches apart for a 33-inch wheel.

To the twenty-first interrogatory, the witness saith :

21. I have answered this question in my last preceding answer.

To the twenty-second interrogatory, the witness saith :

22. I have examined model A, and find it a correct representation of the eight-wheel car shown and described by Tredgold. I have also examined model C. It is not a correct representation of the Tredgold car. It would not conform to the irregularities of a railroad ; it would not turn to go round a curve, or to pass off on a switch. It would not distribute the load equally among the wheels, nor would it perform any of the duties required of an eight-wheel car.

To the twenty-third interrogatory, the witness saith :

23. It is substantially like the eight-wheel cars now in general use ; and its essential features of operation are the same ; both are swiveling cars. One has side bearings, the other has not.

To the twenty-fourth interrogatory, the witness saith :

24. It is calculated to conform to all the irregularities of railroads, and to answer all the purposes and objects set forth in Winans's specification. In respect to the centre bearing, it is precisely like Winans's specification, and so far differs from the cars now in general use, as they have side bearings.

To the twenty-fifth interrogatory, the witness saith :

25. I have examined a copy of Fairlamb's drawing and specification. The double truck under or near each end of the body or frame and coupled remote from each other. Attached near each end of the body is a bolster, and another of the same kind is attached to the centre of each of the trucks. A king-bolt passes through these bolsters, upon which the trucks and body turn. It is a swiveling car ; but the wheels in each truck are not coupled by a spring, but are held in a frame made of wood. Both Fairlamb's and Winans's are intended to conform to the curves and irregularities of a railroad. In Fairlamb's, the axles are not held rigid, but slide in a socket.

To the twenty-sixth interrogatory, the witness saith :

26. I think he would. I have no doubt I could construct a practical eight-wheel car, with Fairlamb's drawing as a model before me, without any inventive faculties, even if I had never before seen an eight-wheel car ; and when so constructed, it would embody all the essential principles of the eight-wheel railroad cars now in general use with the exception of the sliding axles, and would be capable of accomplishing all the beneficial results claimed by Mr. Winans.

To the twenty-seventh interrogatory, the witness saith :

27. I have examined the drawings marked G and H, shown me by the Commissioner, of Allen's steam carriage. The mechanical principles of construction and operation of the running gear under a body connected by a king-bolt, with side bearings, and the trucks swiveling so as to conform to all the curves and irregularities of a railroad. It has rigid wheel-frames, with pedestals and springs, and side bearings. It is well calculated to attain all the beneficial results of the eight-wheel railroad cars now in general use ; and, also, all claimed by Winans for his car. It is a practical car, in every respect. The wheels are about as far apart as the gauge of the track, and the trucks are coupled to the body remotely from each other. If the large wheels were taken off, and ones of the size of the others put in their place, it would not change the principle or action of the car or carriage.

To the twenty-eighth interrogatory, the witness saith :

28. I have examined the model marked "G. Bryant." It consists of two trucks, each with four wheels, rigidly held in a stout wheel-frame ; the bearing points of the wheels distant apart about or the exact width of the track. The trucks are sufficiently remote from each other to allow of their swiveling freely without being brought into contact with each other. They are attached to the body by a king-bolt, and there are side bearings. The swiveling action is on the same mechanical principles as the cars now in general use, and is well calculated to attain all the beneficial results of Winans's car.

To the twenty-ninth interrogatory, the witness saith :

29. All that is essential and calculated to make the car run smoothly and evenly and safely, and conform to all the curves and irregularities of a railroad.

To the thirtieth interrogatory, the witness saith :

30. I think I should be able to construct a car like those now in general use, with one of the Quincy cars before me, even if I had never seen an eight-wheel car ; nor would it require invention to do so.



To the thirty-first interrogatory, the witness saith :

31. I have seen and examined the works referred to. The mode of drawing cars by the body is distinctly shown in these works.

To the thirty-second interrogatory, the witness saith :

32. I have examined Strickland's work, and find the bearing points of the wheels in the trains of cars shown there, about as far apart as the width of the track.

To the thirty-third interrogatory, the witness saith :

33. They were so applied.

To the thirty-fourth interrogatory, the witness saith :

34. It was, and they were so shown, as I understand.

To the thirty-fifth interrogatory, the witness saith :

35. It would not, is my answer to all these questions, down to the last. It would not, in my opinion, require invention to make any and all of these changes.

To the thirty-sixth interrogatory, the witness saith :

36. It is not material ; for it could be changed by a change of the size of the wheels, without varying the mechanical principles or mode of operation of the car containing them.

To the thirty-seventh interrogatory, the witness saith :

37. It is very important and essential ; as upon this depends the proper action of the truck and the car. I think no man could understand the true mechanical principles of the construction and operation of the eight-wheel car, who should give such a direction for the placing of the wheels as is contained in Winans's specification. He does not intimate the size of the wheel to be used ; but without regard to size, directs that the flanges of the wheels shall be as near together as they can be without touching, so as to give them the action of a single pair of wheels. I have measured the distance of the wheels in each truck apart, of one of the passenger cars run on the Hudson River Railroad ; they are twenty-one and a half inches apart ; the curves of this road are more numerous, and of shorter radii than roads generally, to follow the windings of the bank of the Hudson River ; and the average speed of running the cars is at least between thirty-five and forty miles an hour.

To the thirty-eighth interrogatory, the witness saith :

38. It is material and essential that the axles of the wheels in each truck be held in a rigid frame, at a uniform distance from each other. Unless they are so held, the trucks are wrenched out of square, and the tendency of the wheels is to climb the rail. A flexible truck could not be run, at the present rates of speed, with any kind of safety. As soon as a truck is wrenched out of square, it is unfit for use, and it is difficult to keep them on the track. An examination of the wheels where the axles are out of parallelism, invariably shows wear on the inside of the flanges, which clearly satisfies me that they are brought in contact with the rails so securely as to make them too dangerous for use.

To the thirty-ninth interrogatory, the witness saith :

39. Although I have been engaged in the construction of cars for the last nineteen years, I never heard of Ross Winans, or any one else claiming the invention of the eight-wheel car until about the year 1843.

To the fortieth interrogatory, the witness saith :

40. I do not consider the theory of Winans correct, nor do I believe it can be carried into practice. He seems to have reversed the then well-known principles of constructing cars, in order, I should judge, to produce something new, rather than practical and useful. His specification is long enough to continue all that would be necessary to enable a car builder to construct a car ; but instead of employing plain language to convey directions how a car should be built, it is filled with speculative theories, unsound in practice. A truck, with the wheels coupled together by a long spring, could not be run on a road with safety, as it would be too flexible. If the wheels were placed close together as they could be, without the flanges touching, the action would be so much like a single wheel that the truck would run too unsteady, and wobble too much to be easy for the body, or safe to the car.

To the cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

[Cross-interrogatories, page 654.]

To the first cross-interrogatory, he saith :

1 X. I have stated my experience in my answer to the second direct inquiry.

To the second cross-interrogatory, he saith :

2 X. This question is also answered in my answer to the second direct interrogatory.

To the third cross-interrogatory, he saith :

3 X. I have not, except in one patent case.

To the fourth cross-interrogatory, he saith :

4 X. I have been accustomed, more or less, to the examination and comparison of machinery, with a view to forming an opinion as to its utility for practical use, and identity with other machinery.

To the fifth cross-interrogatory, he saith :

5 X. I have not so stated.

To the sixth cross-interrogatory, he saith :

6 X. I consider myself theoretically and practically acquainted with the principles involved in the construction and operation of railroad cars of various kinds ; and I think I am competent to judge what kind are useful, and what not. In the construction of cars, certain principles are essential to adapt them to a safe and practical use at high rates of speed. The near proximity of wheels in a truck will not give the car steadiness of motion, nor ease, in passing curves ; nor will it perform anything like as well as one wheel ; the bearing points of the wheels are as far apart as the width of the track.

To the seventh cross-interrogatory, he saith :

7 X. A car should move around curves with as little friction as is compatible with the other duties it has to perform.

To the eighth cross-interrogatory, he saith :

8 X. It will.

To the ninth cross-interrogatory, he saith :

9 X. It will not, as I have stated in my previous answers.

To the tenth cross-interrogatory, he saith :

10 X. It will not. The greatest freedom of motion is not desirable in a truck. It requires something to steady it, to make it run smoothly and evenly. If it has too much freedom of motion, the flanges of the wheels are knocking first against one rail and then against the other. This is unpleasant to passengers in the car, and often dangerous.

To the eleventh cross-interrogatory, he saith :

11 X. I don't know that I am, with railroad engineering; but I consider that I am with the mechanical structure of cars, and their operation. Experience, reading and conversation are my means of knowledge.

To the twelfth cross-interrogatory, he saith :

12 X. The trucks of the four-wheel cars run as smoothly and steadily on the track as the trucks of an eight-wheel car, but the manner of connecting the truck with the body is what gives greater ease of motion to an eight-wheel car than was attained in the four-wheel car. Great length of car body is not desirable. Those cars which are most in use, and considered the best, are those with bodies about forty-two feet in length, and the trucks are placed from five to six feet from the ends of the body.

To the thirteenth cross-interrogatory, he saith :

13 X. It is.

To the fourteenth cross-interrogatory, he saith :

14 X. It is not. The last truck in the back car of a train has too much motion; and the car does not run as steadily as other cars in the same train.

To the fifteenth cross-interrogatory, he saith :

15 X. It is not.

To the sixteenth cross-interrogatory, he saith :

16 X. The model B represents about the same bearing surface as is shown in the drawing. If anything the drawing shows a trifle more bearing surface than the model; but the drawing does not correspond with the model, or with the specification of Winans; and no one, on reading the specification, and looking at the drawing, would think that the latter was a representation of what is described in the specification.

To the seventeenth cross-interrogatory, he saith :

17 X. It does not show any mode of draft, nor is any named in Winans's specification.

To the eighteenth cross-interrogatory, he saith :

18 X. It is; a long spring which couples the wheels in each truck, and is used instead of a frame.

To the nineteenth cross-interrogatory, he saith :

19 X. I do.

To the twentieth cross-interrogatory, he saith :

20 X. The description represents an eight-wheel car, a six-wheel car, and the drawing a six-wheel car. The specification and drawing are sufficient to enable a car-builder to construct a car without any difficulty, as may be seen by a perusal of it: "Fig. VIII shows a carriage of six wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels, are, as usual on railways, fixed to the body of the carriage; 2, 2, and 3, 3, the other two pair,

are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised as that two thirds of its weight should lie over the central point of the four wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates *c, c*, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves, or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal waggon. And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of axis 1, 1, a transom, such as described (laying the weight equably upon both); and then, similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway." The draft appears, from the drawing, to be applied to the body.

To the twenty-first cross-interrogatory, he saith :

21 X. There is not. The mode of drawing a car is shown by the train of cars on plate 1, fig. 1, of the same book; that is, by a coupling from the middle of the end of the body. As that is the only method shown, and there being no directions to change it, it would still remain as the mode used, with the additional improvements of the two four-wheel trucks and longer body, as described in the book.

To the twenty-second cross-interrogatory, he saith :

22 X. There is. I quote that part of Tredgold which recites it :

"When a carriage has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels. In the case where eight wheels are applied to support one body, if the body rests upon the wheel-frame of each set of four wheels, in the middle of its length, (see Fig. 26, Plate IV,) and is connected with those frames so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure." "Page 179, Plate IV, Fig. 26. A diagram to show how a waggon may be made with eight wheels, so that the stress of each wheel on the rails of a railroad may be equal. The body of the waggon rests on the wheel-frames at A, A, and is connected to them by an axis, on which the frames turn, when from any inequality the axes of the wheels are not in the same plane." (See page 94.)

To the twenty-third cross-interrogatory, he saith :

23 X. Allen's carriage has two trucks swiveling under one body; the wheels in each are further apart than recommended by Winans; the bolsters are near the ends of the body, and the two trucks are coupled remotely from each other. The objects and purposes of Winans and Allen are the same, and the mode of arranging the body with the trucks, and connecting them by a king-bolt, is the same; and the action, so far as swiveling to conform to the curves and other irregularities of the road, is the same. The structures differ in detail; Allen's has rigid rectangular wheel-frames, side-bearings, pedestals with springs, and two wheels in each truck larger than the others—all of them used in the cars in general use, excepting the larger wheels.

To the twenty-fourth cross-interrogatory, he saith :

24 X. This question is answered in my last answer.



To the twenty-fifth cross-interrogatory, he saith :

25 X. He would. Any mechanic of ordinary intelligence, with Allen's, Bryant's, Chapman's, and Tredgold's car before him, or with either of them, would have a sufficient guide to enable him to construct a practical car, such as are now in general use, if he had never seen one before. The whole principle of the eight-wheel cars are embodied in each and all of these cars.

To the twenty-sixth cross-interrogatory, he saith :

26 X. I do.

To the twenty-seventh cross-interrogatory, he saith :

27 X. To the truck, I understand.

To the twenty-eighth cross-interrogatory, he saith :

28 X. I do not. Different modes of draft have each their advantages.

To the twenty-ninth cross-interrogatory, he saith :

29 X. They are, to both branches.

To the thirtieth cross-interrogatory, he saith :

30 X. It has not. Chapman's car was drawn from the body.

To the thirty-first cross-interrogatory, he saith :

31 X. They would not ; nor would the experience, from 1830 to the present time, teach a mechanic that putting the wheels of the trucks very near together, would reduce the friction between the flanges of the wheels and the rails over curves.

To the thirty-second cross interrogatory, he saith :

32 X. It would not.

To the thirty-third cross-interrogatory, he saith :

33 X. It would not, for reasons stated in preceding answers.

To the thirty-fourth cross-interrogatory, he saith :

34 X. I do not know that there is, but the cars are of a construction that renders them peculiarly fitted for a high rate of speed.

To the thirty-fifth cross-interrogatory, he saith :

35 X. It is not. That was one of the objects ; another was, to have them run smoothly and evenly, and perform all that was required of an eight-wheel car.

To the thirty-sixth cross-interrogatory, he saith :

36 X. I cannot say to what extent they were used in the transportation of passengers ; but they were adapted to that species of railroad traffic.

To the thirty-seventh cross-interrogatory, he saith :

37 X. I have not.

To the thirty-eighth cross-interrogatory, he saith :

38 X. I am not.

To the thirty-ninth cross-interrogatory, he saith :

39 X. I have not.

To the fortieth cross-interrogatory, he saith :

40 X. I have not stated that I was a railroad superintendent.

To the forty-first cross-interrogatory, he saith :

41 X. I have not.

To the additional direct interrogatories, on the part of the Respondent, the witness answers as follows :

[Further direct interrogatories, page 659.]

To the first further direct interrogatory, he saith :

1. I have answered this question in my answer to the thirty-ninth direct interrogatory.

To the second further direct interrogatory, he saith :

2. It would not. The change would be one of proportion only, involving no new principles.

To the third further direct interrogatory, he saith :

3. It would not.

To the fourth further direct interrogatory, he saith :

4. There is not. The body might be increased to double its present length, and the trucks separated twice the distance apart that they now are, without changing the principles or action of the car, or interfering with the objects and purposes set forth by Tredgold.

To the fifth further direct interrogatory, he saith :

5. There is not.

To the sixth further direct interrogatory, he saith :

6. There is not.

To the seventh further direct interrogatory, he saith :

7. There is not, and the change to a longer body or platform could not alter the operation of the car, or render it any the less useful than it is in its present shape. As I have said previously, these changes are those of proportion only.

To the eighth further direct interrogatory, he saith :

8. The mechanical theory of Winans's specification is: to connect the two pair of wheels in each bearing carriage as close together as possible, without their flanges touching, to act like a single pair of wheels, and have their axles as nearly to coincide with the radius of the curves as possible; these wheels being connected by long springs bolted to the tops of the boxes, and a waggon bolster extending across between the springs. The centre of the bolster to bear the weight of the load; two of these are connected, one at or near or beyond each end of the car. The mechanical theory of the eight-wheel car in use is: to have a rigid wheel-frame truck, with the axles held parallel to each other, and distant about the same as the rails of the track, forming a square with the bearing points of the wheels, from one to the other, as near as may be, so that the active and re-active force shall be balanced about the king-bolt centre. The action of the spring is confined vertically to the track, and the stiff frame holds the wheels square on the track; two of these trucks are connected to the car body by transom-plate centres and king-bolts, one being placed from five to seven feet within and from each end of the body, sufficiently far to sustain the body with the least strain, and protect the truck from collision in trains. This mechanical structure and theory and Winans's mechanism and theory are essentially different.

To the ninth further direct interrogatory, he saith :

9. It is not. The body recommended by Winans is double the usual length of the four-wheel car bodies, being about twenty-six feet in length.

To the tenth further direct interrogatory, he saith :

10. I have answered this question fully in my previous answers, and given such illustrations as have occurred to me.

To the cross-interrogatories in addition on the part of the Plaintiff, the witness answers as follows :

[Further cross-interrogatories, page 660.]

To the first further cross-interrogatory, he saith :

1 X. The theory of Winans's specification is expressed as follows, in the words of the specification : "From this consideration, when taken alone, it would appear to be best to place the axles as near to each other as possible, thus causing them to approach more nearly to the direction of the radii of the curves, and the planes of the wheels to conform to the line of the rails." "To avoid this effect, and the unpleasant motion and tendency to derangement consequent upon it, an additional motive is furnished for placing the axles at a considerable distance apart." "The object of my invention is, among other things, to make such an adjustment or arrangement of the wheels and axles, as shall cause the body of the car or carriage to pursue a more smooth, even, direct and safe course, than it does as cars are ordinarily constructed, both over the curved and straight part of the road, by the before mentioned desideratum of combining the advantages of the near and distant coupling of the axles, and other means to be hereinafter described." "The two wheels on either side of the carriages are to be placed very near to each other; the spaces between their flanges need be no greater than is necessary to prevent their contact with each other," and, "provided that the fore and hind wheels of each of them be placed very near together; because the closeness of the fore and hind wheels of each bearing carriage, taken in connection with the use of the two bearing carriages coupled remotely from each other, as can conveniently be done for the support of one body, with a view to the objects and on the principles herein set forth, is considered by me a most important feature of my invention." "The two wheels on either side of one of the bearing carriages may, from their proximity, be considered as acting like a single wheel." "The bearing of the load on the centre of the bolster, which also is the centre of each bearing carriage, likewise affords great relief from the shocks occasioned by the percussion of the wheels on protuberant parts of the rails, and other objects, and from the vibrations consequent to the use of coned wheels; as the lateral and vertical movements of the body of the car resulting from the above causes are much diminished."

"When the bolsters of the bearing carriages are placed under the extreme ends of the body, the relief from shocks and concussions, and from lateral vibrations, is greater than it is when the bolsters are placed between the middle and ends of the body; and this relief is not materially varied by increasing or diminishing the length of the body, while the extreme ends of it continue to rest on the bolsters of the bearing cars, the load being supposed to be equally distributed over the entire length of the body."

This is the theory of Winans's alleged invention, in the words of the specification. The mechanism he employs to carry it out, consists of long springs, the ends of which are bolted to the boxes of the axles, and waggon bolsters with king-bolts, extending across between the springs to connect with the body.

To the second further cross-interrogatory, he saith :

2 X. I cannot say.

To the third further cross-interrogatory, he saith :

3 X. They were, and railroads are so constructed at this time. Dis-

tribution of weight on a greater surface of rail was no more important then than now.

To the fourth further cross-interrogatory, he saith :

4 X. Two, I understand. The Stockton and Darlington, and Liverpool and Manchester.

To the fifth further cross-interrogatory, he saith :

5 X. They were used for all purposes, the same as now, but to a much less extent.

To the sixth further cross-interrogatory, he saith :

6 X. I cannot say what the rate of speed was.

To the seventh further cross-interrogatory, he saith :

7 X. I have—eight-wheel cars. GEORGE BEACH.

Subscribed and sworn before me, this December 14, 1853.

JOS. F. SABINE, *Com'r*, &c.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 14th day of December, A. D. 1853, George Beach, of Troy, in the county of Rensselaer, and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner by the Circuit Court of the United States within and for the District of Massachusetts, to take answers to the interrogatories and cross-interrogatories herewith returned, at my office, in the city of Syracuse, in said State of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of the said Court. And the foregoing deposition, given by him in my presence, was reduced to writing by me and by my clerk in my presence, before signing, and was then subscribed by said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending undetermined in the said Court, between the parties aforesaid.

Given under my hand and seal, this 15th day of December, A. D. 1853.

JOS. F. SABINE, *Com'r*.

DEPOSITION OF STEPHEN W. WORDEN.

Stephen W. Worden, a witness, being duly sworn, to the direct interrogatories on the part of the Respondents, answers as follows :

[Interrogatories, page 649.]

To the first interrogatory, the witness saith :

1. My name is Stephen W. Worden ; age, 38 years ; place of business and residence, Troy, New York ; and occupation, car-builder.

To the second interrogatory, the witness saith :

2. I have been engaged in the construction of railroad cars for twenty years, during which time I have become both theoretically and practically acquainted with the mechanical principles of railroad machinery, and familiar with the operation of eight-wheel and other cars, both in their construction and practical operation.



To the third interrogatory, the witness saith :

3. I am.

To the fourth interrogatory, the witness saith :

4. I have examined said specification fully, and believe I understand the same.

To the fifth interrogatory, the witness saith :

5. I have examined model B, and find it correct in all respects with the description of a car recommended in his specification.

To the sixth interrogatory, the witness saith :

6. The essential characteristics of construction and arrangement of the eight-wheel car are : two trucks under one body, the body to be of sufficient length to allow the trucks to swivel without collision against each other ; the trucks should be placed far enough apart advantageously to support the body upon the trucks, it being generally found in practice expedient to place the bolsters about five to six feet from the end of the car body. The trucks themselves should have four wheels each, held in rigid frames, that are well braced, to keep them square ; the wheels in each truck should be distant apart, from centre to centre, or between the bearing points, about the same as the gauge of the track, so as to form a square on the track from one bearing point to the other. The middle or centre of each truck must have a king-bolt connection with the body, and the body must have side-bearings in the truck frame, to steady itself and prevent the rocking or tipping from one side to the other when in motion. The distance between the bearing points of the wheels on the rails is the essential and elemental feature. The distance between the flanges is not essential or material ; but results from the diameter of the wheels and the distance between the bearing points on the rails. It is the action of the bearing points of the wheels upon the track, and the reaction of the track upon these bearing points, which govern and control the motion of the car upon the rails.

To the seventh interrogatory, the witness saith :

7. They have a variety of them, including side bearings, brakes, pedestals and springs, Imlay's transom plate or circle, rocking bolsters, patent lubricating boxes, safety beams in the truck frames, draw-spring couplings, solid-hub wheels, and bodies about double the length recommended by Winans in his specification.

To the eighth interrogatory, the witness saith :

8. They are, by unhitching the check chains, and taking out the king-bolt. They are placed from five to six feet.

To the ninth interrogatory, the witness saith :

9. They do have side bearings ; and it is essential they should, to steady the body, and prevent its swaying to and fro, or oscillating from one side to the other, when the car is at a high rate of speed. They also steady the truck, and make it run more uniform and less zigzag, than it is wont to run when it has too much freedom.

To the tenth interrogatory, the witness saith :

10. They are, very commonly, to prevent the trucks from turning crosswise the track, when the car is thrown from the track, and to prevent the truck from dropping down when a wheel or axle breaks.

To the eleventh interrogatory, the witness saith :

11. It does not, any more than it would to make a pair of shoes

longer, after shorter ones had been manufactured. No new principle of construction or action is introduced by lengthening the body, provided it is not carried to extremes either way. It is entirely a change of proportions.

To the twelfth interrogatory, the witness saith :

12. I can do so from experience. In the summer of 1838 I was Superintendent of Construction and Repairs of Cars, for the Richmond and Fredericksburg and Potomac Railroad. The shop was in Richmond, Virginia ; and at that time a pair of trucks, constructed precisely similar to model B, and to the specification of Ross Winans's patent, were brought to me at the shop, and I had orders to put them under a car and try them. I understood that they were constructed in and brought from Baltimore. I put them under a platform car, what we called then a timber car, and it was put in a train for trial ; and it proved a total failure. The trucks would not stay on the track ; the car run off, and the trucks were smashed to pieces, so much so, that we considered them a total failure, and threw them away, as not practical, and too dangerous to use. I afterwards put other trucks under the platform, the same as we had previously been using, that is, with a rigid frame, like the cars now in use. The Winans truck, as described in his specification, is utterly worthless, and of no practical use. It is dangerous ; too dangerous to use.

To the thirteenth interrogatory, the witness saith :

13. I have examined the drawing of the railroad freight car shown me, and find the running gear or trucks essentially different from those recommended in the specification. They are connected to the body as recommended by Winans, which (the body) rests on a bolster, like that of a common road waggon. The trucks in the drawing have rigid rectangular wheel-frames, made of sufficient strength to hold the axles parallel and the wheels square, and to prevent their being wrenched out of square, by passing over the rough parts of the track. They also have springs and brakes, and the draft is from the end of the body—neither of which are mentioned or described in the patent of Winans.

To the fourteenth interrogatory, the witness saith :

14. I have examined a copy of the specification and drawings of W. & E. W. Chapman, annexed to this commission.

To the fifteenth interrogatory, the witness saith :

15. I have examined model K, and consider that it truly and correctly represents the eight-wheel car described and shown in said work. It has the stout rigid wheel-frames, centre pin, and side bearings.

To the sixteenth interrogatory, the witness saith :

16. I have no hesitation in saying that I could construct an eight-wheel car, like those now in general use, with this model, drawing and specification before me, without exercising any inventive powers.

To the seventeenth interrogatory, the witness saith :

17. It has all of them, and they are all essential.

To the eighteenth interrogatory, the witness saith :

18. By measurement, the distance between the bearing points of the wheels is the same as the width of the track.

To the nineteenth interrogatory, the witness saith :

19. It may, by substituting a single pair of wheels for one of the four-wheel trucks.

To the twentieth interrogatory, the witness saith :

20. I have examined said Treatise on Railroads, &c., by Thomas Tredgold, and find the drawing and description of an eight-wheel railroad car.

To the twenty-first interrogatory, the witness saith :

21. It has a long body resting on two trucks, having four wheels in each, and the body and trucks connected by a centre pivot and cylinder socket in the centre of each truck, on which the trucks turn and conform to the curves and other inequalities of the road. Each truck has solid wheel-frames, which hold the axles square, and the wheels are placed distant from each other in the trucks, about as far as the width or gauge of the track. Such trucks are now made for the cars in general use, with the wheels about the same distance apart.

To the twenty-second interrogatory, the witness saith :

22. I have; and find it correct with the drawing and description—just such a one as I should make. Model C is not correct, either to the drawing or description of Tredgold. It will not turn on the road to conform to curves or other inequalities; and it would not run upon a railroad.

To the twenty-third interrogatory, the witness saith :

23. They agree in the construction of trucks, in their mode of connection with the body, and in their swiveling motion. The cars now in use have side bearings—Tredgold's does not. In mechanical principles and mode of operation they are substantially the same.

To the twenty-fourth interrogatory, the witness saith :

24. I think it is better calculated to conform to the irregularities of a railroad, and to answer the purposes and objects set forth in the Winans specification, than his is.

To the twenty-fifth interrogatory, the witness saith :

25. I have examined a certified copy of said patent and drawings. I find in the said drawings, clearly shown, the peculiarities claimed in said Winans's patent, excepting that the axles of the wheels are borne by a rigid rectangular wheel-frame, and not connected together by yielding springs. The close proximity of the flanges of the wheels in each truck is there shown, the flanges being represented as but a very few inches apart. The trucks are constructed in two ways; one allows the axles of the wheels a certain limited motion in the truck-frame itself, with a view of allowing it to conform to sharp curves, as represented in figures 1 and 2—while the other truck, in figure 2, is constructed in the ordinary manner, allowing no play to the axes; each of these trucks swivel under the body by means of large transom plates, and are placed near the ends of the body of the car. Fairlamb's drawings embrace all of Winans's arrangement. One of the trucks in figure 2, allows the axles to play, and the other truck is the rigid wheel-frame holding the axles parallel, as is the case in the cars in general use. So far, therefore, as regards the near coupling of the wheels in each truck, and the remoteness of the trucks from each other, it is identically the same as Mr. Winans's.

To the twenty-sixth interrogatory, the witness saith :

26. I think I should have no difficulty in constructing a practical

eight-wheel car with the drawing before me; nor would it require invention to do so.

To the twenty-seventh interrogatory, the witness saith :

27. I have examined the drawings of the Allen steam carriage, marked G and H. It is borne by two trucks; each has four-wheels, in a rectangular rigid wheel-frame, that preserves the parallelism of the axes; the points apart at which the wheels bear upon the rails are about equal to the width or guage of the track. The truck-frame is united to the axes of the wheels by means of springs and pedestals, similar to those now in general use, which, while it gives ease of motion to the burden carried, effectually prevents the axes from at any time losing their parallelism, by confining the motion allowed by these springs at all times to planes perpendicular to the track and equidistant from each other; thus the wheels will always be kept square on the track. The fore and hind wheels of the truck are of different diameters; but this fact is wholly immaterial. Each truck has a bolster running across the centre of the same, from side to side; and this bolster is connected with an upper bolster, on which the steam carriage rests, by means of a large swiveling pivot or king-bolt, operating also as a transom plate, and the trucks swiveling readily and freely to the curves and other inequalities of the road.

There are also anti-friction side bearings upon each truck, to keep the body of the steam carriage from rocking, and assist in supporting the same. The two trucks are placed so near the ends of the steam-carriage, that the ends of the truck-frames project beyond the body; and this position is best calculated to sustain the weight of the body. A part of the body hung down between the two trucks. The body of the steam-carriage is long, so that it readily rests on two four-wheel trucks, allowing them to swivel to the curves without interfering with each other; and the distance of the bearing bolsters is nearer to the ends of the body than the position now usually adopted in passenger cars, from the end of the body platform. The steam apparatus may be taken off, leaving the bolsters and all other parts as they are, and a platform or body for passengers substituted, without invention; and this carriage combines all the mechanical elements of the eight-wheel railroad passenger car, as ordinarily used, embodied in a manner well adapted to pass smoothly, steadily, and safely, over the straight track as well as the curves and irregularities of railroads, and indeed, contains all the most essential features of the running gear now in general use; and is far better calculated to attain the objects described by Winans's specification, than the mode of arrangement which is recommended in the patent itself. The whole of the objects or beneficial results set out in Winans's patent, and much more, are embodied in Allen's steam carriage.

To the twenty-eighth interrogatory, the witness saith :

28. I have examined said model, marked "G. Bryant," and find that it contains rigid wheel-frames for the trucks, with the bearing points of each about as far apart as the width of the track. It is connected with a body or frame, the same as the Allen carriage or car, and possesses the same mechanical principles that are embodied in the cars now in general use.

To the twenty-ninth interrogatory, the witness saith :



29. All that is material to cause the car or carriage to pursue a smooth, even, direct, and safe course, and to swivel to the curves, and conform to all the inequalities of the road.

To the thirtieth interrogatory, the witness saith :

30. I think I should, without question.

To the thirty-first interrogatory, the witness saith :

31. I have examined said works, and find in the drawings represented, the mode of draft from the ends of the body of the cars ; and I think it was well known prior to 1830.

To the thirty-second interrogatory, the witness saith :

32. I have examined the said work last mentioned, and find the bearing points of the wheels about as far apart as the width of the track, which is the distance adopted in the cars now in general use in the United States.

To the thirty-third interrogatory, the witness saith :

33. They are distinctly shown in the drawings in Wood's Treatise of 1831, and Allen's carriage.

To the thirty-fourth interrogatory, the witness saith :

34. They were for specific objects, and are described—Tredgold and Wood treatises.

To the thirty-fifth interrogatory, the witness saith :

35. None of the forgoing changes involve anything else than alteration of the proportions, or substitution of well-known equivalents for each other. It would therefore require no invention whatever to make these changes.

To the thirty-sixth interrogatory, the witness saith :

36. It is not, for the reasons given in one of my previous answers.

To the thirty-seventh interrogatory, the witness saith :

37. The distance between the bearing points of the wheels in each truck on the rails is material, because it is through the bearing points that the rails direct or guide the car in its motion over the road.

To the thirty-eighth interrogatory, the witness saith :

38. Maintaining the axles of the wheels in each truck at a fixed and uniform distance from each other is material, because it is necessary to hold the axles to keep the wheels square and steady, and the truck upon the track.

To the thirty-ninth interrogatory, the witness saith :

39. I do not recollect anything that I have not mentioned.

To the fortieth interrogatory, the witness saith :

40. This theory of connecting the wheels in a truck, by a large long spring, and bringing them as close together as they can be without the flanges touching, so as to give them, as near as may be, the action of a single pair of wheels, is entirely wrong ; and when reduced to practice, is valueless, as my experience has satisfied me. A flexible truck will not answer to run on a road. It has not sufficient strength to withstand the severe shocks and wrenches to which it is subjected ; and it would be twisted so much out of square that it could not be kept on the track. I judge from experience and observation.

[Cross-interrogatories, page 654.]

To the cross-interrogatories on the part of the Plaintiff, this witness answers as follows :

To the first cross-interrogatory, he saith :

1 X. I have stated my experience in my answers to the second direct interrogatory.

To the second cross-interrogatory, he saith :

2 X. I have, in constructing and repairing cars. I have been so long engaged in the manufacture of cars that I feel conversant with the construction of cars in all their details.

To the third cross-interrogatory, he saith :

3 X. I have never been.

To the fourth cross-interrogatory, he saith :

4 X. My occupation, for the last twenty years, has led me to the examination and comparison of railroad machinery, with the view to forming an opinion as to the substantial identity, capacity and combination of machinery.

To the fifth cross-interrogatory, he saith :

5 X. I have not so stated.

To the sixth cross-interrogatory, he saith :

6 X. I have been long enough engaged in railroad machinery to be competent to understand the principles involved in the construction and operation of railroad cars, and feel myself competent to judge what is requisite to make good cars, capable of being run at the highest rates of speed, with steadiness of movement over all parts of a railroad.

To the seventh cross-interrogatory, he saith :

7 X. It is desirable to have as little as possible in going round curves ; but all other considerations must not be overlooked for that. It is equally as important that a truck should run steadily and free from oscillation on the straight line of the road.

To the eighth cross-interrogatory, he saith :

8 X. I think it will.

To the ninth cross-interrogatory, he saith :

9 X. I think not. If the wheels are as far apart, from centre to centre, as the width of the track, I think the truck will move round curves as easy, if not not easier than when the wheels are brought as close together as they can be. Winans's theory, in this respect, does not correspond with my experience, in the least.

To the tenth cross-interrogatory, he saith :

10 X. They will not. Trucks do not require too much freedom of action ; for if they have it, they would wobble too much, and the flanges are too often brought in contact with the rails. Trucks want something to steady them, to prevent their being turned back and forth, from the obstructions they constantly encounter, or to give them a zig-zag or serpentine motion, as they would have if there was not something to steady them.

To the eleventh cross-interrogatory, he saith :

11 X. I am sufficiently acquainted practically with car building to make the comparison. My knowledge is principally derived from experience and reading.

To the twelfth cross-interrogatory, he saith :

12 X. It is not. I have always understood, and my experience corresponds with it, that the four-wheel cars, when suitably connected in a train, run as steady, at high rates of speed, as the eight-wheel cars. Making the car body of great length is rather an indefinite mode of

determining what the proper length should be. If great length means a car one hundred feet long, I have no hesitation in saying it would not run as well as one half the length. Great length is not essential to greater steadiness of motion at high velocities, than could be attained by the four-wheel cars as formerly constructed.

To the thirteenth cross-interrogatory, he saith :

13 X. It is so.

To the fourteenth cross-interrogatory, he saith :

14 X. It is not. The first truck is restrained by the draft. The last truck in a train has too much freedom.

To the fifteenth cross-interrogatory, he saith :

15 X. It is not. Many of the cars now in general use are drawn from the king-bolt.

To the sixteenth cross-interrogatory, he saith :

16 X. I think it does. There may be a slight difference in the length of the bolsters, but it is not essential.

To the seventeenth cross-interrogatory, he saith :

17 X. Model B shows no mode of attaching the draft; nor is any alluded to in the specification of Winans's patent.

To the eighteenth cross-interrogatory, he saith :

18 X. Certainly. Instead of a truck-frame he recommends a long spring with which to connect the wheels.

To the nineteenth cross-interrogatory, he saith :

19 X. I do.

To the twentieth cross-interrogatory, he saith :

20 X. It certainly does. The description may be found on page 139. It is in these words, which, taken in connection with the drawing, is ample to guide a mechanic in the construction of an eight-wheel car, capable of performing all that the cars of the present day perform.

"Fig. VIII shows a carriage of six wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels, are, as usual on railways, fixed to the body of the carriage; 2, 2, and 3, 3, the other two pair, are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised as that two thirds of its weight should lie over the central point of the four wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates *c, c*, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal wagon. And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute in place of axis 1, 1, a transom, such as described, (laying the weight equably upon both) and then similarly to two coal wagons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway."

To the twenty-first cross-interrogatory, he saith :

21 X. There is not; but in another plate, in the same work, there is a train of cars shown to be drawn from the centre of the ends of the body; and in the absence of any other direction, this would be suffi-

cient to warrant applying the same modes of draft to the eight-wheel cars.

To the twenty-second cross-interrogatory, he saith :

22 X. There is. He says, "When a carriage has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels. In the case where eight wheels are applied to support one body, if the body rests upon the wheel-frame of each set of four wheels, in the middle of its length, (see figure 26, plate IV) and is connected with these frames so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure. If one frame with its four wheels be removed, and an axis with two wheels applied in its place, the carriage would have six wheels; and it would be easy to adjust the load so that the pressure on each pair of wheels should be equal." Fig. 26. "A diagram to show how a waggon may be made with eight wheels, so that the stress of each wheel on the rails of a railroad may be equal. The body of the waggon rests on the wheel-frames at A A, and is connected to them by an axis, on which the frames turn, when, from any inequality, the axes of the wheels are not in the same plane."

To the twenty-third cross-interrogatory, he saith :

23 X. Winans's invention consists of the long spring, to connect the wheels in each truck, instead of a wheel-frame, which would hold the axles parallel, and the waggon bolsters at or near the ends of the body; and the wheels in each truck being placed as near together as they can be without the flanges touching, so that they will act like a single wheel. Winans describes only the spring trucks, which are attached to the body, the same as Allen's trucks are attached to the body or frame. This claim is for the spring truck and near connection of the wheels, but both his and Allen's are swiveling cars; but they vary in the modes of construction. Both are intended to reach the same objects. One is practical; the other is not. Winans deviated from the usual mode of constructing trucks, while Allen preserved the mode well known prior to 1830; and the result was, that the latter had a practical, serviceable eight-wheel car, while the former's plan was a visionary experiment which never could be reduced to practice.

To the twenty-fourth cross-interrogatory, he saith :

24 X. This question is substantially answered in the last preceding answer.

To the twenty-fifth cross-interrogatory, he saith :

25 X. He could; and could have derived his knowledge from Chapman, Tredgold, Bryant or Allen. The cars of either being sufficient to enable a mechanic to go on and construct cars, which would move safely and smoothly over the curves and irregularities of a railroad, at any reasonable rate of speed, without exercising inventive powers.

To the twenty-sixth cross-interrogatory, he saith :

26 X. I do, for some specific objects.

To the twenty-seventh cross-interrogatory, he saith :

27 X. It is said that it drew from the end of one of the trucks.

To the twenty-eighth cross-interrogatory, he saith :

28 X. I do not consider it a matter of indifference. Different modes have each their advantages.



To the twenty-ninth cross-interrogatory, he saith :

29 X. They were.

To the thirtieth cross-interrogatory, he saith :

30 X. Chapman's car was drawn by the body.

To the thirty-first cross-interrogatory, he saith :

31 X. They would not ; nor would the experience of twenty years which I have had, teach me any such thing. Too close proximity of wheels will not give the least friction between the flanges of the wheels and the rails, in passing round curves ; nor does it give that steadiness of motion to a truck so important in the safe running of cars.

To the thirty-second cross-interrogatory, he saith :

32 X. It would not.

To the thirty-third cross-interrogatory, he saith :

33 X. It would not. The greatest possible freedom to a truck is not desirable, or tolerated by car-builders. The hind truck of the last car in a train has more freedom than any other one in a train, as it is not restrained by the draft, and it runs the most unsteady of any truck in a train, and the car is the most unpleasant one to ride in.

To the thirty-fourth cross-interrogatory, he saith :

34 X. There is no particular description about cars running at high velocities, in Chapman or Tredgold ; but the structures described and shown by them, as well as those of Bryant and Allen, possessed all the arrangements and combinations that are now used in these structures, to run safely at high rates of speed.

To the thirty-fifth cross-interrogatory, he saith :

35 X. It is not. The weights that were carried could have been subdivided, I have no doubt.

To the thirty-sixth cross-interrogatory, he saith :

36 X. They were, I have no doubt. They were capable of doing all that the cars of the present day do.

To the thirty-seventh cross-interrogatory, he saith :

37 X. I have not.

To the thirty-eighth cross-interrogatory, he saith :

38 X. I am not.

To the thirty-ninth cross-interrogatory, he saith :

39 X. I have not.

To the fortieth cross-interrogatory, he saith :

40 X. I am not a railroad superintendent.

To the forty-first cross-interrogatory, he saith :

41 X. I have not.

To the further direct interrogatories on the part of the Respondents, the witness answers as follows :

[Further interrogatories, page 659.]

To the first further interrogatory, he saith :

1. I do not.

To the second further interrogatory, he saith :

2. It would not.

To the third further interrogatory, he saith :

3. It would not.

To the fourth further interrogatory, he saith :

4. There is not.

To the fifth further interrogatory, he saith :

5. I answer in the same way.

To the sixth further interrogatory, he saith :

6. The same answer as last above.

To the seventh further interrogatory, he saith :

7. It would not.

To the eighth further interrogatory, he saith :

8. There is a difference. Winans's theory is, to make an elastic truck ; bring the wheels in each truck so near together that their action is like a single pair of wheels ; and to rest the body at each end on a bolster like the common waggon bolster, without side bearings, or any thing to prevent the body from rocking to and fro. This is his theory, and what his patent claims ; but the action of the car is very different from what he claims for it. The cars now in general use have rigid wheel-frames, to hold the axles firmly parallel, and the bearing points of the wheels are as far apart as the width of the track. This makes the trucks run much steadier and safer than when brought very close together.

To the ninth further interrogatory, he saith :

9. It is not. The body he recommends cannot be to exceed twenty-eight feet in length.

To the tenth further interrogatory, he saith :

10. The "greatest possible freedom of swiveling" is not proper in trucks ; and they would not be safe to run if they were so made. They should have sufficient freedom to conform to all the curves and irregularities of a railroad ; but they should not have so much as to keep the flanges thrashing or striking the rails in passing obstructions, elevations and depressions, common to all roads.

[Further cross-interrogatories, page 660.]

To the further cross-interrogatories on the part of the Plaintiff, the witness answers as follows :

To the first further cross-interrogatory, he saith :

1. I have answered this interrogatory fully, and stated what I consider Winans's theory to be, in my answer to the eighth further direct interrogatory.

To the second further cross-interrogatory, he saith :

2. I am not able to say.

To the third further cross-interrogatory, he saith :

3. They were in some instances constructed with less strength than they are now ; in others they were not. Distribution of weight upon the track of a railroad is always desirable ; not more so prior to 1830 than now.

To the fourth further cross-interrogatory, he saith :

4. Two, I have always understood. The Manchester and Liverpool, and the Stockton and Darlington.

To the fifth further cross-interrogatory, he saith :

5. They were employed for general traffic, and drawn by horses and by steam power.

To the sixth further cross-interrogatory, he saith :

6. I am not able to say what the rate was.

To the seventh further cross-interrogatory, he saith :

7. I have, in 1838, and from thence till now.

STEPHEN W. WORDEN.

Subscribed and sworn before me, this Dec. 14, 1853.

JOS. F. SABINE, *Com'r, &c.*

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

On this 14th day of December, A. D. 1853, Stephen W. Worden, of Troy, in Rensselaer County, and State of New York, being the same person named in the foregoing commission, appeared before me, Joseph F. Sabine, appointed a Commissioner, by the Circuit Court of the United States within and for the District of Massachusetts to take answers to the interrogatories and cross-interrogatories herewith returned, at my office, in the City of Syracuse, in said State of New York, and was sworn according to law, and carefully examined on oath, agreeably to the directions of said Court, and the foregoing deposition given by him, in my presence, was reduced to writing by me, before signing, and was then subscribed by said witness.

Taken by virtue of the foregoing commission, to be used in the above entitled cause, now pending in the said Court, between the parties aforesaid.

Given under my hand and seal, this 15th day of December, A. D. 1853.

JOS. F. SABINE, *Comr, &c.*

## UNITED STATES OF AMERICA.

THE CIRCUIT COURT OF THE UNITED STATES WITHIN AND FOR THE MASSACHUSETTS DISTRICT.

MASSACHUSETTS DISTRICT, ss.

To Elias Merwin, of Boston, in said District, Esquire, U. S. Commissioner, and to all other Commissioners of the said Court in this District :

Know ye, that reposing confidence in your wisdom, prudence, and fidelity, we have appointed, and by these presents do authorize and empower you, to take the answers to the interrogatories hereunto annexed of Albert S. Adams, Godfrey B. King, George S. Griggs, Wm. Raymond Lee, Waldo Higginson, Wm. B. Parrott, Asahel Durgan, Henry W. Farley ; John B. Winslow, Providence, R. I. ; John Crombee, Northfield, Vt. ; R. H. Eddy, Ezra Lincoln, Samuel Cooper, James Hayward, Cambridge ; Daniel N. Pickering, Salem ; Geo. Starke, Salem ; James H. Andrews, Providence, R. I. ; Charles Davenport, Cambridge—witnesses to be examined on behalf of the Respondent, and to be used in a certain cause now pending in said Court, wherein Ross Winans is Plaintiff, *versus* the Eastern Railroad Company, Defendant.

And to this end, at certain days to be by you appointed for that pur-

pose, to cause said witnesses, as aforesaid, to be brought before you, and each witness, while present before you, to examine carefully on oath touching the premises. And when you shall have taken the examination as aforesaid, to reduce or cause the same to be reduced to writing, and to be subscribed by each of said witnesses in your presence. And the same, so taken and subscribed, to return, together with this commission, and your doings herein enclosed, sealed and directed to the Circuit Court aforesaid, holden at Boston, as soon as the same shall have been executed.

In testimony whereof we have caused the seal of the said Circuit Court to be hereunto affixed.

Witness, the Honorable Roger B. Taney, at Boston, this eighth day of October, in the year of our Lord one thousand eight hundred and fifty-three.

H. W. FULLER, *Clerk*.

N. B.—You shall not, except by consent of the parties in writing, permit either party to attend at the taking of the depositions, either himself, or by any attorney or agent, nor to communicate by interrogatories or suggestions with the deponents, whilst giving their depositions in answer to the interrogatories annexed to this commission. And you shall take such depositions in a place separate and apart from all other persons, and permit no person to be present during such examination, except the deponents and yourself, and such disinterested person (if any) as you may think fit to appoint as a clerk to assist you in reducing the depositions to writing. And you shall put the several interrogatories and cross-interrogatories to the deponents in their order, and take the answer of the deponents to each, fully and clearly.

## UNITED STATES OF AMERICA.

### DISTRICT OF MASSACHUSETTS.

Be it remembered, that in pursuance of the commission herewith inclosed, to me directed, a Commissioner of the Circuit Court of the United States for said District, I caused I caused [?] to come before me, A. H. Eddy, William F. Parrott, Henry W. Farley, Godfrey B. King, Samuel Cooper, and George S. Griggs, deponents named in the said commission, personally and severally, on the first day of December, in the year eighteen hundred and fifty-three, and from time to time on other days, and by adjournments from said first day of December, until the twentieth day of February, in the year eighteen hundred and fifty-four, which adjournments were necessary to the taking of the said deponents' depositions.

And the said deponents having been by me, then and there severally first duly cautioned and sworn to testify the truth, the whole truth and nothing but the truth, in answer to the interrogatories and cross-interrogatories and further interrogatories to said commission annexed, did, on the respective days and times aforesaid, give the several six depositions herewith inclosed, to which the names of the said deponents are by them respectively subscribed, which were so subscribed in my presence. And I further certify that the said several depositions were taken apart and separate each deponent from all other persons, and that no one was present during the taking of the same but the



said deponents respectively and separately, myself, and Henry L. Hallett, a disinterested person, who was appointed by me my clerk to assist me in reducing the depositions to writing. And in propounding said interrogatories and in all other respects, the directions in said commission contained, were complied with, and the several answers of the said deponents were taken to each of said interrogatories and were reduced to writing by said clerk in their presence.

Witness my hand and seal. B. F. HALLETT, *U. S. Comr.*

## UNITED STATES OF AMERICA.

DISTRICT OF MASSACHUSETTS, SS.

On the nineteenth day of October, A. D. 1853, and on the first and second days of February, A. D. 1854, personally appeared before me, the Commissioner named in the annexed commission, at my office, in the City of Boston, Albert S. Adams, one of the witnesses named in the foregoing commission.

And on the nineteenth day of October aforesaid, the said Albert S. Adams, named in said commission, having been by me first duly cautioned, and sworn to testify the whole truth, did depose and say, in answer to the several direct and cross-interrogatories to said commission annexed, as follows :

## DEPOSITION OF ALBERT S. ADAMS.

[Interrogatories, page 649.]

*Ans. to Int. 1.* My name is Albert S. Adams ; my age is thirty seven years ; my place of business and residence is Boston. I am a machinist by profession, and am now the superintendent of the motive power on the Boston and Worcester Railroad.

*Ans. to Int. 2.* I have been a machinist for the last twenty-three years. The first four years I built cotton machinery ; then I was sixteen or eighteen years building locomotives, and tools, and railroad work generally ; and I have now been for three or four years in the employment of the Boston and Worcester Railroad Company, having the charge of all the motive power of the road, and all the mechanical work on the road generally. For the last twenty years I have had recourse to a library containing most, if not all the mechanical works now extant.

*Ans. to Int. 3.* I am.

*Ans. to Int. 4.* I have examined the copy of the specification inquired of.

*Ans. to Int. 5.* I have examined the model marked B, and should say that it is a true representation of the car described and recommended in said specification.

*Ans. to Int. 6.* First, that the distance between the centres of the truck-axles should be about as far apart as the width of the track, at least. Second, that there should be a rigid rectangular truck-frame, with side bearings, upon which shall rest the whole weight of the car.

*Ans. to Int. 7.* They have improvements not described in said specification, but not any new inventions. The first improvement is having a rigid truck-frame ; another is, that the centres of the wheels of the

truck are placed about as far apart from each other as the width of the track, and that they have side bearings upon which the whole weight of the car body is suspended, instead of the weight being upon the centre of the truck, as recommended in the Plaintiff's specification, and at a point below the centre of the axes of the wheels. The Plaintiff's specification describes a car drawn either from the truck or the end of the body, of the car. The cars used by the Eastern Railroad draw by the king-bolt, upon which the truck centre swivels. The Plaintiff's specification describes a car with the wheels in each truck very close together, with the mistaken idea of avoiding friction thereby. The cars on the Eastern Railroad, and in general use now, have the wheels in each truck about two feet apart; for these reasons: first, to make the truck steady, and thus carry the body of the car steadily; second, to avoid friction produced by wobbling, and bringing the flanges of the wheels in contact with the rail; third, to save wrenching the rails unnecessarily; fourth, to distribute the weight over a large space upon the rail; fifth, to give a larger base to the support of the truck; sixth, the application of spring pedestals, so that the wheels and axles are allowed a vertical motion independent of the truck-frame, while there is a lateral motion independent of the truck.

*Ans. to Int. 8.* They are so constructed that by taking out the king-bolt, the body of the car can be removed. The bolster of the trucks is usually placed about seven feet from the end of the framing of the body.

*Ans. to Int. 9.* They do have side bearings; first to keep the body of the car steady; second, to prevent a too free swiveling of the truck, and thereby causing more friction upon the rail.

*Ans. to Int. 10.* They are in use, for the purpose of preventing the truck from turning round too far, and to hold up the truck in case a wheel breaks.

*Ans. to Int. 11.* It does not introduce any new mechanical principle to change the length of the car, neither does it require any exercise of invention.

*Ans. to Int. 12.* It is not practicable nor safe to connect the axles of the truck of a passenger or freight car with springs, for the following reasons: first, it is decidedly unsafe; if one or both of the springs should break, there would be nothing to guide the wheels and prevent them from turning round, and of course the destruction must be very great. Second, the centre of axles would be constantly varying by the motion of the springs, horizontally, whereas the truck frame should be constantly kept square. The variation produced by the action of the springs causes more friction upon the rail than there would be if there was a rigid truck frame, from its constant inclination to cross the rail, by the wheels being too near together, as described in the Plaintiff's specification.

*Ans. to Int. 13.* I have examined said drawing. It does not represent a car with the running gear like that described and recommended in the specification. First, the drawing describes a rigid truck-frame, while in the car described in the specification the wheels are connected by springs. Second, the springs are the reverse of those described in the specification, the short leaves being down in the drawing instead of up, as described in the specification. Third, the wheels in the drawing

are farther apart than is described in the specification. Fourth, the bearing is outside of the wheels instead of inside, as described in the specification.

*Ans. to Int. 14.* I have seen and examined a copy of the same.

*Ans. to Int. 15.* I have examined the model marked K, and it truly and correctly represents the car shown in the drawing attached to said copy of the patent of William and E. W. Chapman.

*Ans. to Int. 16.* He would be able.

*Ans. to Int. 17.* It has all three of those qualifications.

*Ans. to Int. 18.* It is about equal to the width of the track. I have measured the same.

*Ans. to Int. 19.* It can be made to represent both.

*Ans. to Int. 20.* I have examined said work and drawings, and I do find therein a drawing and description of a double-truck eight-wheel railroad car, on page 179.

*Ans. to Int. 21.* The car there described is an eight-wheel car, with a rigid truck-frame, with its bearing points upon the centre of the truck, with the centre of the wheels about as far apart as the width of the track. The truck-frame is connected to the body of the car by a centre pivot, and the car is drawn by the middle of the end of the body. The trucks are placed about as far from the end of the body of the car as in those that are now in use on railroads generally. The operation of it is that it will conform to all the curvatures and irregularities of the track.

*Ans. to Int. 22.* I have examined the model marked A, and it is a correct representation of said eight-wheel car. I have examined the model marked C, and it is not a correct representation of any eight-wheel car described by said Tredgold, because it does not contain the swiveling principle; also the bearing is upon the side instead of upon the bolster in the centre of the truck, as represented in model A.

*Ans. to Int. 23.* The mechanical principles of the eight-wheel Tredgold car and of those used by the Eastern Railroad, and the country generally, are the same. Their mode of operation is not the same. In the Eastern Railroad cars, and in the cars generally in use in this country, all the weight is borne on the side bearings. In the Tredgold car the weight is borne upon the bolster, or centre of the truck. That is all the difference.

*Ans. to Int. 24.* The objects set forth in Winans's specification are the same in principle as those described by Tredgold, and the Tredgold car will accomplish the same objects that Winans designed to accomplish.

*Ans. to Int. 25.* I have examined a certified copy of said Fairlamb's patent, drawings and specifications, and do not find that any part of the invention described or claimed by said Winans is described or shown therein.

*Ans. to Int. 26.* A mechanic having ordinary skill in car building, having knowledge of said Fairlamb's patent and drawings, could construct the cars inquired of, without exercising invention. Such cars would embody the same principles as the eight-wheel cars now in use, and they would attain the beneficial results which the said Winans claims to effect in his patent, but which, in point of fact, a car constructed according to his specification would not accomplish. For, in

the Winans car the irregularity of the truck caused by the constant yielding of the springs, and the truck's constant inclination to cross the track, by being too near together and without the aid of side bearings, make the car ride very unsteady and unsafe. A car constructed according to said Fairlamb's patent and drawings would have a rigid truck-frame, and bearing points about as far apart as the width of the track.

*Ans. to Int. 27.* I have examined said model and drawings. The mechanical principles of the construction and arrangement of the running part of said carriage, are the same as those of the eight-wheel cars now in use, and is calculated to attain the same practical benefits as they are; and the construction and arrangement of its running gear is the same as theirs. It does contain the construction and organization necessary to produce the beneficial results claimed by Winans in his specifications. In both the Horatio Allen carriage and the car described by said Winans, there are two trucks, with four wheels to each truck.

*Ans. to Int. 28.* I have examined said model. It has two trucks of four wheels each, with centre and side bearings, with a frame on the top of the trucks for carrying loads. The frame has a bearing on the bolster and sides of the truck. The truck has a rigid frame to keep the wheels square, and the bearing points of the wheels in each truck about five feet apart from each other. It is adapted to pass all the inequalities and curves as well as the straight track of the roads, and its mechanical principles are the same with the cars now used by the Eastern Railroad, and in the country generally, and also with said model of the Eastern Railroad car. The mode of operation of the Bryant car and the Eastern Railroad car varies in this particular: the Bryant car has no side motion, while the Eastern Railroad car has; the Eastern Railroad car has spring pedestals; the Bryant car has rigid immovable bearings.

*Ans. to Int. 29.* There is; in the first place there are two trucks, with four wheels in each truck; and the same swiveling principle to conform to the curvatures and straight lines of the track.

*Ans. to Int. 30.* He could have constructed a car substantially alike in the particulars inquired of, to the double truck eight-wheel cars now in general use, without any invention of his own.

*Ans. to Int. 31.* I have examined all the works inquired of. Previous to the year 1830, it was a well-known fact that all cars were drawn from the middle of the end of the body, and that mode of drawing was shown and described in various printed works; it is in the works inquired of in the question.

*Ans. to Int. 32.* As represented in the drawings in each of said works the bearing points of the wheels are nearly as far apart as the track is wide. In the best constructed cars now in use in the United States, the bearing points of the wheels are the same distance apart as the width of the track.

I wish here to correct my answer to the twenty-fifth direct interrogatory. In making that answer, I accidentally entirely overlooked figure No. 2, in Fairlamb's drawing. I wish to say now that figure No. 2, in the drawing attached to the certified copy of said Fairlamb's patent, represents all the peculiarities of Winans's truck, as described in his



specification, with the exception of truck-frame. And I also wish to alter my answer to the twenty-sixth interrogatory, in the last clause thereof, by stating that I find, upon an examination of figure No. 2, in Fairlamb's said drawing, the wheels in the truck are represented as being very near together, and would be a very good representation of Winans's truck with the exception of the truck-frame.

*Ans. to Int. 33.* They were.

*Ans. to Int. 34.* The mode inquired of in this interrogatory was well known before the year 1830, and had been described and shown in printed works prior to that date.

*Ans. to Int. 35.* Not any or all of the variations mentioned in this interrogatory, would involve any change in the mechanical principles or modes of operation of the Quincy car, and it would not require invention to make any of those changes.

*Ans. to Int. 36.* The distance of the flanges from each other, of itself considered, is not material. The varying the distance between the wheels does not alter any mechanical principle, unless you spread them so far apart as to use up all the play-room there is between the flanges and the rail, or so near together that the flanges will touch.

*Ans. to Int. 37.* That distance is material. If too near together, the wheels have a strong tendency to cross the rail, thereby causing friction, which causes a wobbling motion to the truck, and more friction than there would be if the distance between the bearing points of the wheels was about equal to the width of the track. The further apart you get the bearing points of the wheels, without taking up all the space allowed between the flange of wheels and the rail, more steadily the truck will pass curvatures and inequalities of the road.

*Ans. to Int. 38.* It is material and essential. First, because all variations from the square of the centre line of action increases the friction upon the flanges of the wheels and rail, and I should not consider a car safe with trucks so arranged as to yield to every slight resistance.

*Ans. to Int. 39.* Nothing occurs to me now more than I have already stated.

*Ans. to Int. 40.* The theory of said Winans is not correct; first, because the wheels are too near together, thereby causing too much vibration to the truck between the rails, in consequence of which there is a large amount of friction between the flange and rail; second, the arrangement of the truck, by holding the axles by springs, bolted to the boxes of the same, is not practical nor safe; third, the nearness of wheel-bearings, and the absence of side-bearings, would cause a car to ride very unsteadily. The operation of a car constructed according to the Plaintiff's specification, would not be safe, for two reasons; first, if one or both of the springs should break which hold the axles in their proper position, of course the wheels would not remain on the track, and the car body would have nothing to guide it, and would lose its forward line of motion, and thereby cause destruction; second, because of the constant vibration of the truck, and tendency to cross the track. My opinion is founded on an examination of said Winans's specification, and the model made from that specification.

And in answer to the following cross-interrogatories annexed to said commission, the said deponent answers as follows:

(Cross-interrogatories, page 654.)

*Ans. to 1 X Int.* I have built cotton machinery for four years, and had the charge of the Union Works, South Boston, for fifteen years, in the construction of locomotives, stationary engines, and tools of all descriptions; and during that time I had charge of various kinds of railroad work, and for the last three years and a half I have had charge of all the running work of the Boston and Worcester Railroad, including the motive power of the road, and repairs generally.

*Ans. to 2 X Int.* I have been so conversant. I have been called upon to examine cars for the last three years and a half, in the capacity and under the circumstances set forth in my answer to the first cross-interrogatory.

*Ans. to 3 X Int.* I never have been until now.

*Ans. to 4 X Int.* I have been so accustomed. I have frequently been called upon to examine machinery, and to give my opinion in reference to its utility, practicability, and the like, especially railroad machinery.

*Ans. to 5 X Int.* It has been my duty, and now is, to attend to the construction and arrangement of the running gear of cars and engines on the Worcester Railroad.

*Ans. to 6 X Int.* I answer affirmatively to this interrogatory, in all its branches.

*Ans. to 7 X Int.* It is important to avoid friction between the flanges of the wheels and the rail, so far as it can be done consistently with the proper construction of the car, with regard to safety, and other essential features, which must, at all events, be secured. Friction is not the only evil to be avoided; but to construct an eight-wheel car in the best manner, it is necessary to make a compromise between different evils and different advantages. It will not [?] to forget one in order to secure the other.

*Ans. to 8 X Int.* The active force is in the wheels, and the resistance is in the rails, and the friction between the flanges of the wheels and the rails is proportionate to the amount of force or pressure with which the flanges are brought against the rails, and does not depend merely upon the resistance which the wheels offer to the guidance of the rail, as there may be great friction when the wheels make no resistance to the guidance of the rail. For instance, when a truck first enters a curve, the rails cause the truck to swivel round into a position which is retained until the truck leaves the curve. During the passing of the curve, the wheels offer no resistance to the guidance of the rail, and yet there will be greater friction on all the four wheels of the truck upon the upper rail, because the centrifugal force on the car bears all the four wheels equally against the outer rail. By guidance of the rails I mean the turning of the trucks.

*Ans. to 9 X Int.* It will not answer to put the wheels as close as they can be without the flanges touching, as stated in Winans's specification, as they would have too much lateral motion between the rails. They would not be sufficiently steady, and would get too oblique to the rails, and would cause or produce the lateral friction of the flanges, which the specification proposes to obviate. The means and method described by Winans will not produce the effect or benefit at which he aims. Bringing the wheels as near together as Winans directs will

cause more friction than placing them farther apart. It was once supposed that bringing the wheels nearer together would diminish friction, but modern experience has shown the contrary to be true. In the construction of all modern cars, builders have increased the distance between the centre of axles in each truck. On the Worcester Railroad a locomotive is now running with only four wheels, and all of them are drivers, with the axles united to a solid frame, having no swiveling motion whatever. The distance between the bearing points is sixteen feet, and we find no difficulty in passing our sharpest curves. We are also now placing the axles of the trucks farther apart under our ordinary locomotives.

*Ans. to 10 X Int.* I answer this interrogatory in the negative. Where the trucks have the greatest freedom of motion they will wobble about on the track, from side to side, and by so doing cause far more friction of the flanges against the rails than if kept more steady on the track. With the greatest freedom of motion the truck could scarcely be kept on the rails at all at a rapid motion. Many contrivances are resorted to in modern car trucks to control their freedom of motion, and to confine it within the bounds of utility and safety. Among them are check chains and side bearings; and to limit the extent of the side motion of the truck and the wobbling about, as well as to avoid unnecessary friction, the best constructed cars have their wheels in each truck placed much farther apart than Winans directs; and thus controlling the freedom of motion of the truck has been found essential to the safety of the cars as well as the avoidance of friction. The operation of the brakes also affect materially the free swiveling of the trucks. The extent of the swiveling motion of the trucks in passing curves and straight lines, has been greatly overrated by some. Passing from Boston to Worcester, the truck of our locomotives does not swivel more than half to three quarters of an inch between the extremes of motion measured at the side bearings.

*Ans. to 11 X Int.* I am acquainted with the system of railroad engineering, prior to 1830. My knowledge has been obtained from books and drawings. I am sufficiently acquainted with the state of engineering then to compare it with the present state of railroad engineering.

*Ans. to 12 X Int.* The steadiness of motion is desirable, but lengthening a car body does not attain it.

*Ans. to 13 X Int.* It is essential.

*Ans. to 14 X Int.* It is not necessary that all the trucks in a train should have the same freedom of motion. It is only necessary that each truck should have sufficient freedom. The last truck in a train generally has too much motion.

*Ans. to 15 X Int.* Many years of practical experience have shown that the draft may be applied to and act through the truck, without interfering with any desirable freedom of the motion of the truck.

*Ans. to 16 X Int.* It does.

*Ans. to 17 X Int.* The model B does not show the mode of drawing a car; and none is described or claimed in the specification. The drawing of the freight car shows a coupling-bolt, with a ring in it, but nothing is said about it in the drawing or in the specification.

*Ans. to 18 X Int.* The particular form of the spring described by the Plaintiff, and the connection framing of the same, is to have two large

springs, with the longest leaves downward, the ends bolted to the upper sides of the boxes of the axles, and a bolster extending across between the middle of the springs. This constitutes the Plaintiff's truck or bearing carriage, the wheels being as close as possible, without the flanges touching. This is the only form of spring, or mode of construction specified in the patent, and it is described as an essential part of the Plaintiff's invention.

*Ans. to 19 X Int.* The use of springs, properly applied, is essential to the ease of motion of any railroad car, whether on four, six, or eight wheels. They are not exclusively essential to an eight-wheel car. It is much the best to have springs; but if springs were applied, as directed in the Plaintiff's patent, and a brake were applied to the wheels, the springs would probably be disarranged, and the truck thrown off the track.

*Ans. to 20 X Int.* The Chapman specification inquired of, does describe a railroad car or carriage like model K, which is the same in its principles of construction and action as the cars now in use. It is a car, in the same sense as I call the eight-wheel steam carriage, or the Yankee steam omnibus, a car. Carrying the motive power in an eight-wheel car does not make it any the less a car. The description and drawing, in Chapman, describe both the six and eight-wheel carriage or car now in use, in their essential construction and principles. The language which describes the said car, is as follows: "Our said invention does chiefly consist in the use of a chain or other flexible and continuous substance, stretched along the road to be travelled, properly secured at each end, and at suitable intervals. And in the application of this chain round or partially round a barrel or grooved wheel, in such a manner as not to slip when this grooved wheel, which is fixed upon, before or behind a carriage supporting or containing an internal self-moving power, shall be put in motion by the said power, so that by the revolution of the barrel or grooved wheel round its axis, either one way or the other, it shall necessarily draw the said carriage, and any others which may be attached to it, within its powers of action. We also, as the carriage containing the motive power will, thus loaded, be too heavy, in various cases, for the strength of the existing iron or wooden rails, if resting on four wheels only, so arrange it for such ways (or other confined ways, where the ledges either of the ways or of the wheels regulate the direction of the carriage) that it may rest equably, and move freely round curves or angles, either on six or eight wheels, so as to reduce its pressure on each in the inverse proportion of its number of wheels. Having thus described the outlines of the separate leading parts of our invention, we shall proceed to the means of carrying them into effect. Fig. 1 (Plate V), in the annexed plan, is an elevation of a carriage containing the motive power—be it steam, inflammable gas, or what it may." Page 134: "The switch rail, S, A, being then put into its place." Page 139: "Fig. VIII shows a carriage of six wheels, for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels are, as usual on railways, fixed to the body of the carriage; 2, 2, and 3, 3, the other two pair, are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised as that two-thirds of its weight should lie



over the central point of the four wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two-thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates C, C, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves or past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal waggon. And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equably upon both), and then, similarly to two coal-waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway." The drawing is Figure VIII in the drawing attached to said specification.

*Ans. to 21 X Int.* The drawing of the eight-wheel car does not show any draw-link, but the other drawings do; and in the description of the eight-wheel car there is no description of the draw-link.

*Ans. to 22 X Int.* Tredgold's treatise and drawings show that the two trucks swivel sideways. The drawing and description together show it also. The figure 26 in said drawings, represents the trucks so arranged as to swivel sideways. It is thus described in the Treatise, page 179. "The body of the waggon rests on the wheel-frames at A A, and is connected to them by an axis on which the frames turn, when from any inequality, the axes of the wheels are not in the same plane."

*Ans. to 23 X Int.* The general principles of the running gear in both are the same. That is to say, Allen embodies the principle of two four-wheel trucks swiveling under the body, for the same purpose as Winans describes in his patent. But Allen's carriage has the axes of the wheels farther apart, and is decidedly preferable to Winans's in that respect. It also has spring pedestals, which are infinitely superior to Winans's springs. It also has a truck-frame, and Winans's has none. It has side bearings, and Winans's has none. Allen, therefore, does not embody those peculiar devices of long springs, and bearing all the weight upon the centre of the bolster, which are found in Winans's, nor the too close proximity of the wheels in each truck. In all other particulars, Allen's and Winans's are substantially the same; and in the respect in which Allen differs from Winans, he agrees with the cars now in common use. The parts in Winans's specification resembling the Allen carriage, are thus described: "For this purpose, I construct two bearing carriages, each with four wheels, which are to sustain the body of the passenger or other car, by placing one of them at or near each end of it, in a way to be presently described," with the exception that the wheels in the Allen carriage are farther apart than described by Winans.

*Ans. to 24 X Int.* As to the Quincy car, I should say it contained all that is essential in the eight-wheel double truck car, but it does not contain the elastic spring truck, and the bearing of the weight of the load exclusively upon the centre. In these respects it differs from Winans, and agrees with the cars now in common use. The parts in Winans's specification resembling the Quincy car, are thus described by said Winans: "For this purpose I construct two bearing carriages, each with four wheels, which are to sustain the body of the passenger

or other car, by placing one of them at or near each end of it, in a way to be presently described," with the exception that the wheels in the Quincy car are farther apart than in the specification of said Winans.

*Ans. to 25 X Int.* From what was well known in 1830, a mechanic acquainted with car building would have known what was wanted to run at the rate of thirty miles per hour, and do what cars now have to do. Both four-wheel cars and eight-wheel cars had been already described and used, which would have been capable of running at those rates safely and smoothly. Cars had frequently been run at the rate of fifteen miles per hour, and one locomotive at the rate of thirty miles per hour. And any car builder must easily have seen, and the inventions then existing show, that they did see enough to enable them to build cars, which did and do answer the purposes to which they are now put on our railroads.

*Ans. to 26 X Int.* I do.

*Ans. to 27 X Int.* The Quincy car drew by the truck, I am informed.

*Ans. to 28 X Int.* Different modes of draft have different consequences. Some are best in one case, and some are best in another. It is not a matter of indifference.

*Ans. to 29 X Int.* They were.

*Ans. to 30 X Int.* The Chapman patent shows a mode of draft attached to the body, or what amounts to the same thing. In other cases the draft was by the truck.

*Ans. to 31 X Int.* I have before said that placing the wheels of the truck very near together will not reduce the friction between the flanges of the wheels and the rails over curves as well as straight lines. The idea that placing the wheels of the trucks very near together will reduce the friction between the flanges of the wheels and the rails over curves, is not set forth in any of the drawings or descriptions mentioned in this interrogatory.

*Ans. to 32 X Int.* I have already said that steadiness of motion cannot be obtained by building car bodies of great length, and supporting it upon two trucks, as described in Winans's patent; and neither of the drawings or descriptions referred to would have taught to any mechanic, in the year 1830, or would now teach any such idea.

*Ans. to 33 X Int.* I have already said that giving the truck the greatest possible freedom to conform to the rails, is not consistent with safety, speed or steadiness of motion; and the drawings and descriptions referred to, would not have taught, in 1830, and do not teach now, to any mechanic, such an idea.

*Ans. to 34 X Int.* Before 1830, four and eight-wheel cars were made and described in books, so constructed as to be capable of running on our New York express train forty miles per hour. Such description is contained in Tredgold's treatise and Chapman's treatise on railroads.

*Ans. to 35 X Int.* No. The language of Tredgold and Chapman shows that these cars were made for the same purposes as those in common use. The language in Chapman showing this is contained on page 139, commencing with the words "Fig. VIII," and ending with the words "the curves of the railway." In Tredgold the language is contained on page 2 of the extract annexed to this commission,

commencing with the words "the body of the waggon rests," and ending "in the same plane."

*Ans. to 36 X Int.* I never saw any eight-wheel car in use before 1830, and therefore I cannot answer this question from personal knowledge. So far as I am informed eight-wheel cars were used previous to 1830, mostly as burden cars.

*Ans. to 37 X Int.* I answer this interrogatory, no, in all its branches.

*Ans. to 38 X Int.* As I have before said, I am the Superintendent of the motive power on the Boston and Worcester Railroad, and that company use a great number of eight-wheel cars.

*Ans. to 39 X Int.* For aught I know, Winans's is good for his peculiar mode of uniting the axles by the long springs, bolted to the boxes in which the axle turns, and bearing the weight upon the centre of bolster, when these peculiarities are combined in one car. I have formed an opinion that the said Winans's letters patent are invalid for want of novelty and originality. I formed this opinion after having examined his letters patent and compared them with the description of the previously existing cars and carriages referred to. I did not converse with any person to my recollection upon the novelty and originality of Winans's said invention before said invention and comparison.

*Ans. to 40 X Int.* I am not a member of any association of railroad superintendents, and have no knowledge of any of the matters inquired of in this interrogatory. I have not instructed, or aided, or consulted with the counsel or solicitor for the Defendants, in the preparation of the defence of this case.

*Ans. to 41 X Int.* I have not.

And in answer to the further direct interrogatories the said deponent further saith:

[Further interrogatories, page 659.]

*Ans. to 1 Direct Int. res'd.* I have known Mr. Winans for a number of years past. He has been in and about the repair shops of the Boston and Worcester Railroad, a number of times, in my presence. I have conversed with him about railroad machinery of various kinds, and he has seen a great number of double truck eight-wheel cars, in the shop and on the road, in use. He never objected to their being used, and never gave any intimation that they embraced any improvement patented by him. I have bought wheels of him, which he knew were used for eight-wheel cars, and I never derived from him any idea that such cars as ours were supposed to infringe upon him.

*Ans. to 2 Direct Int. res'd.* It would not introduce any new mechanical principle or mode of operation.

*Ans. to 3 Direct Int. res'd.* It would not.

*Ans. to 4 Direct Int. res'd.* I answer, to all branches of this question, that there is not.

*Ans. to 5 Direct Int. res'd.* I make the same answer to this question as to the fourth direct interrogatory resumed.

*Ans. to 6 Direct Int. res'd.* I make the same answer to this question as to the fourth direct interrogatory, resumed.

*Ans. to 7 Direct Int. res'd.* I answer both parts of this question in the negative.

*Ans. to 8 Direct Int. res'd.* There is a great and essential difference in the two mechanical theories.

*Ans. to 9 Direct Int. res'd.* It is not.

*Ans. to 10 Direct Int. res'd.* I have already answered this question.

And in answer to the additional cross-interrogatories, the said Depo-  
nent answers and says :

[Further cross-interrogatories, page 660.]

*Ans. to 1 X Int. res'd.* I mean by the Plaintiffs' theory, bearing the load on the centre of the bolster, and putting the wheels of each truck very close together by means of elastic springs.

*Ans. to 2 X Int. res'd.* Before 1830, railways were mostly used for freight. The speed varied much. I do not know what the average rate was.

*Ans. to 3 X Int. res'd.* It has always been an object to distribute and not concentrate the weight of cars and locomotives upon the rails. The weight of cars and locomotives has been continually increasing, and the strength of the rails in like manner. Railroads were constructed prior to 1830 with a view to the same object.

*Ans. to 4 X Int. res'd.* As I have always understood, the Birmingham and Manchester, and Stockton and Darlington railways, used to carry passengers before 1830.

*Ans. to 5 X Int. res'd.* Horse power, stationary engines and locomotives were used. With the exception above mentioned, in my answer to the preceding question, they were principally used for the transportation of freight.

*Ans. to 6 X Int. res'd.* The freight roads run a low speed compared with the passenger roads. I do not know what to call an average speed.

*Ans. to 7 X Int. res'd.* I have not designed railroad cars myself, but have planned the running gear of many.

A. S. ADAMS.

## UNITED STATES OF AMERICA.

DISTRICT OF MASSACHUSETTS, SS.

Be it remembered, that in pursuance of the commission hereunto annexed, to me directed, I caused Albert S. Adams, one of the witnesses named in the said commission, to appear before me, on the nineteenth day of October, A. D. 1853, and on the first and second days of February, A. D. 1854, and the said deponent having been by me first carefully examined, and cautioned, and sworn to testify the whole truth, did, on the respective days aforesaid, give the foregoing deposition, in answer to the several direct and cross-interrogatories to said commission annexed. And I do certify that the said deposition was taken apart from all other persons, and that no one was present during the taking of the same but the said deponent and myself; that in propounding the several interrogatories, and in all other respects, the directions in said commission contained were complied with; that the said deposition was by me carefully reduced to writing, and was thereafter subscribed by the said deponent in my presence.

ELIAS MERWIN, U. S. Com'r.



## DEPOSITION OF GODFREY B. KING.

I, Godfrey B. King, of East Cambridge, in the District of Massachusetts, Superintendent of Motive Power, Cars, and Machinery, on the Boston and Lowell Railroad, aged forty-five years, on oath depose and say, in answer to interrogatories proposed to me on behalf of the Respondents, in the case of *Ross Winans v. The Eastern Railroad Company*.

[Interrogatories, page 649.]

*1st. Ans. to 1st. Int.* My name is Godfrey B. King, my age is forty-five years. My place of business is at the Boston and Lowell Railroad. My residence is at East Cambridge. I am Superintendent of Motive Power, Cars and Machinery, on the Boston and Lowell Railroad.

*2d. Ans. to 2d Int.* I have been educated to the business of theoretical and practical machinist, and for nineteen years past my sole business has been the manufacture and repair of railroad machinery.

*3d. Ans. to 3d Int.* I am familiar with the construction and principles of the eight-wheel car used on the Eastern Railroad, and now in general use.

*4th. Ans. to 4th Int.* I have examined Mr. Winans's specification.

*5th. Ans. to 5th Int.* I have examined model marked "B." I do not see that it could be made to correspond more perfectly with the specification, unless by diminishing the bearing surface between the upper and under bolsters.

*6th. Ans. to 6th Int.* All that I consider essential in the eight-wheel car, that is to say, that which makes the essential difference between the four-wheel and the eight-wheel car is, that in the former the axles of the wheels are all united to the body of the car, and the axles have no power of turning or swiveling, save on their axis, while in the eight-wheel car, the body is supported upon two independent trucks, of four wheels each, so arranged as to be capable of swiveling under or near the ends of the body; thus enabling the builder to extend the body to any length, without thereby bringing the flanges of the wheels at too great an angle with the rails, when passing curves.

Although there is a considerable number of other devices usually employed on the ordinary eight-wheel car, in order to make them more safe and pleasant, yet the same devices are also equally employed on cars with four wheels only, so that the only essential features of the eight-wheel car, as in general use, is that of employing two independent four-wheel trucks swiveling under one body.

*7th. Ans. to 7th Int.* There is quite a number of them, such as brakes, swinging bolsters, side-bearings, spring couplings, &c. &c.

*8th. Ans. to 8th Int.* Yes, sir, about seven feet.

*9th. Ans. to 9th Int.* No cars are made without side-bearings; and by side-bearings I mean the plates or rollers of iron on which the cars rest, and on which they turn when the trucks turn; and they are placed generally, if not always, on parts of the truck outside of the wheels.

The reason why is asked; to this I reply, that it is because there must be something to counteract the tendency of the car to be thrown towards the outer rail, in passing curves. There must be something to

steady the trucks, and keep them from flying about across the track, from side to side, and keep them steady. There must be something to keep the wheels from flying up too much when passing over any incumbrance on the track. There must be something to prevent the body of the car from swaying over, from side to side, when on the straight track. All these purposes are effectually answered by the use of side-bearings. And in cars such as have always been used on the Eastern Railroad, on the Boston and Lowell Railroad, and, so far as I know, on all other railroads, the entire weight is supported by the side bearings; for when it has been attempted to bear any considerable weight upon the centre of the truck, the cross-timber or bolster of the car body will be bent up in the middle, owing to the weight and width of the car loosening the frame, rendering the floor uneven, and preventing the door from being opened and closed, and in short, rendering the car in a short time useless.

We have cars now in the shops of the Boston and Lowell Railroad, rendered useless and put aside for the above reason. So that we are now satisfied that as cars are now built, they must be supported by side bearings only, and have no weight placed on the centre of the trucks. In the cars I have mentioned as having been put aside, the cars had side bearings, but they were accidentally placed so low as not fully to take the entire weight of the body; hence the difficulty. On our road we have never built an eight-wheel car without ample side bearings.

*10th. Ans. to 10th Int.* They are, for the purpose of preventing the truck from swiveling round too far.

*11th. Ans. to 11th Int.* I do not see that making a car longer or shorter, under these circumstances, can introduce anything new in principle or organization, or that it can require the aid of invention. When once one has the idea of putting two swiveling trucks under one body, it seems as easy to me to place them under a long body as under a short one. And this statement would be true, even if the trucks are not placed at the same distance from the ends of the body; for, as I look upon it, it is only an alteration in dimension or proportion.

*12th. Ans. to 12th Int.* I should not think I was doing right to risk my life, or that of the travellers over our road, by using trucks such as are described in the specification, having the axles coupled by long springs, and having no wheel-frame, and having the entire weight of the load borne upon the centre of the bolster. It appears to me, from mere inspection of such a truck, quite certain that it would never do for practical service; and there are many good reasons for this opinion. 1st. The soundness of the springs cannot in every case be relied upon; and if one of the springs should break, the whole load must come down. 2d. With such a truck, the wheels cannot be kept square on the track; but on the contrary, from the variability of the forces acting on a car in motion, will be continually twisting about; and any one conversant with the operation of railroad machinery is aware that such results are incompatible with safety. 3d. Such trucks cannot be run without great increase of friction of the flanges of the wheels against the rails, because this arrangement allows them to run in a zigzag manner, for want of the side bearings. 4th. No brakes, as now used, and I think none of any kind can be used with this truck, without running great

risk of breaking one or both of the springs, or of throwing the wheels out of square, as the springs will allow the wheels to approach and recede from each other according to circumstances; hence the wheels will be liable to leave the track.

The only truck which can be used in safety is that which has a solid and rigid wheel-frame, capable of retaining the wheels in a correct position, and the springs so arranged that in case of breakage the load will be supported by parts of the truck, and not allowed to fall to the ground.

13. *Ans. to 13th Int.* I have examined the drawing, and I perceive a difference, in several particulars, between that and the specification. Those most noticed by me, and I suppose of most consequence, are those which relate to the improvements of Mr. Winans, claimed in the patent. The drawing does not show the same closeness of the wheels, nor the same position of trucks, nor the same construction of trucks, with springs connecting the axles, nor the same bearing of the load upon the centre of the bolsters, as are described in the specification.

14. *Ans. to 14th Int.* I have examined the book and the patent of the Chapmans.

15. *Ans. to 15th Int.* I have carefully examined the model "K," and compared it with the patent and drawings of Chapman. I consider it correct.

16. *Ans. to 16th Int.* I cannot see that he could help it, so far as the running gear is concerned; for I can see no substantial or practical difference between Chapmans' eight-wheel car and those now in use on the Eastern Railroad.

17. *Ans. to 17th Int.* I find all these things on the Chapman car, else I should not have said (as I did just now) that they were substantially like the cars now in use on the Eastern Railroad.

18. *Ans. to 18th Int.* I should judge by the engravings that the distance between the bearing points was a little less than the gauge of the track.

19. *Ans. to 19th Int.* Yes, sir.

20. *Ans. to 20th Int.* I have examined Tredgold, and have long been familiar with it. I have long known the eight-wheel car described in that book, and sketched in the plate.

21. *Ans. to 21st Int.* The parts are merely sketched; they are not shown with great minuteness. They consist of a large waggon, with two swiveling trucks, placed about half way between the middle of the ends of the body. This proportion for an eight-wheel car, when the body is not braced or trussed, is about the best. The track swivels laterally so as to follow the curves and sinuosities of the road, just as the trucks now in common use do, and the car or waggon operates in the same way.

22. *Ans. to 22d Int.* I consider model "A" a perfect model of the car as shown in the book and plate of Tredgold. But model "C" is not, because it does not swivel laterally, only in one direction horizontally, and that would not answer any of the purposes which Tredgold says he has made his car for, while model "A" would answer them all.

23. *Ans. to 23d Int.* I have compared them and consider them substantially the same thing.

24. *Ans. to 24th Int.* I should say it would, for I think that a car

built after Tredgold's plan and proportions would be more safe, more steady, and run with less friction than Winans's.

25. *Ans. to 25th Int.* I have seen Fairlamb's patent and drawings. The drawings contain what is material and essential, in the car as described in the Winans specification; but it has also some supposed improvements which are not in the Winans car; also some peculiarities of the Winans improvement are not in that.

26. *Ans. to 26th Int.* A mechanic would be able, without invention, by aid of Fairlamb's drawings, to make a car like those in use on the Eastern Railroad, and one which would embody all the principles and attain all the beneficial results of the cars now in common use, so far as concerning the running gear, but *he would have to leave out the supposed improvements of Fairlamb*; also the supposed improvements of Winans, so far as regards the nearness of wheels in each truck, and the bearing the load on the centre of the truck; otherwise he would not get the beneficial results of such cars as the Eastern Railroad Company use—of such as are in common use.

27. *Ans. to 27th Int.* I have examined the model many times and have given the subject of this question due consideration. I answer all these questions in the affirmative.

28. *Ans. to 28th Int.* I have long been acquainted with the Quincy car inquired of, and have frequently examined the model; and I answer this question also in the affirmative.

29. *Ans. to 29th Int.* The Quincy car contains the body, or platform, and two trucks swiveling under its two ends. There is, however, some difference in the proportion of its parts; and there is a difference between the construction of the trucks, and in the bearing of the weight on the centre of the platform. The size of the wheel on the Quincy being, as I am informed, about eighteen inches in diameter, are exactly of the same size as some of the car wheels used for many years on the Lowell Railroad; these wheels are smaller than those shown in Winans's drawing. But none of these differences are essential; although the Quincy car would be far more safe and useful in practice than a car constructed according to Winans's specification, because it has a square and rigid wheel-frame and side bearings.

30. *Ans. to 30th Int.* I think he would have been able to do so, as he would have had nothing else to do but to substitute a car body instead of a platform, and to put in the springs in the way then in common use, if he wished to carry passengers.

31. *Ans. to 31st Int.* I have examined Wood, Tredgold, and Strickland. The mode of draft, by coupling from the middle of the end of the body, was well known previous to 1830. I am not quite sure that any other mode of drawing cars was then in use.

32. *Ans. to 32d Int.* The distance apart of the tread of the wheels on the rails, is just about the same as the gauge of the tracks, in all the best constructed cars in the United States, including those on the Lowell and Eastern Railroads, and that corresponds with the distance represented in the books specified. Many cars are now built with the bearing points in each truck still further apart than the width of the gauge. On the Eastern Railroad many trucks have these points six feet apart, and on the Old Colony Road they are in several instances seven feet apart; and on various railroads they are building the trucks longer and longer, and find great advantage by so doing.



33. *Ans. to 33d Int.* Spring pedestals were an old invention in 1830. These pedestals are sometimes called housings. They are shown in Wood's London Edition of 1831.

34. *Ans. to 34th Int.* Before 1830 these two modes were well known equivalents for each other ; being shown in books and in practice, and mentioned in various reports on English and other railways.

35. *Ans. to 35th Int.* To all the sections of this question I answer in the negative.

36. *Ans. to 36th Int.* The distance of the flanges is, in itself considered, of no importance, if they do not interfere. Change the size of the wheel, and you change the distance of the flanges.

37. *Ans. to 37th Int.* Certainly it is only the bearing points that have any thing to do with the control of the trucks, because they are the only points of contact between the trucks and rail.

38. *Ans. to 38th Int.* The axles must be kept at a fixed and uniform distance from each other, and also square on the *truck* ; if not they will be in constant danger of running off the track every time one of the wheels strikes any uneven junction of two rails, or any other incumbrance or inequality. If the distance of the axles is not uniform and fixed, the wheels may approach and recede from each other, while running, and thus the flanges on one side are at times made to mount the rails and run off the track ; so if the truck is *twisted* even very slightly out of square. I always find that trucks which wear the flanges irregularly, that is, on one wheel more than on another, and in trucks that run off the track, the truck has got twisted. There is no other way to run safely at high speed but to make the trucks very strong, perfectly square, and to keep the axles parallel and at a uniform distance from each other. I think every practical railroad machinist will say this.

39. *Ans. to 39th Int.* I dont recollect any thing in particular.

40. *Ans. to 40th Int.* I think that the general principles of all railroad cars, with two trucks swiveling under one body, are substantially the same ; but when we come to details there is a great difference between the advantages of one mode or another of constructing or combining the parts ; and in this view I think there is an essential difference between the suppositions or assumptions upon which Mr. Winans's improvements are based, and the theory upon which the cars used by the Eastern Railroad, and in common use, are constructed. The supposition in Mr. Winans's specification, that bringing the wheels in each truck as near as possible together, lessens the friction between the flanges and the rails, is *erroneous* ; for the surest way to increase the friction on the rails is to bring the wheels near together ; for they will be continually moving about the centre of the truck, from side to side ; consequently the flanges are constantly biting or digging into the rails, from the serpentine course of the truck. And all this is occasioned by the loss of leverage of the rails on the wheels, which takes place more and more as the wheels are brought nearer together. So that the notions of Mr. Winans on this subject, are quite contrary to what experience has shown to be the case. Then the making of the trucks elastic, by using springs, in order to build cheaply, and make them more safe, I have before stated to be dangerous, and not practicable, though it may be cheap. The bearing of all the weight of the load on the centre of the bolster, on the presumption that this would contribute

to ease and steadiness of motion of the car, is a mistake; for, as I have before shown, such a bearing will render the car both unsteady and unsafe, and would not answer at all; we must have the side bearings. Now in all these particulars the cars on the Eastern Railroad are different.

And in answer to cross-interrogatories, proposed on behalf of the Plaintiff:

[Cross-interrogatories, page 654.]

1 X. *Ans. to 1st Cross-Int.* I have been engaged in this business, as I before said, many years.

2 X. *Ans. to 2d Cross-Int.* This has been the chief object of my attention ever since I was connected with railroads. I have acted in the capacity of superintendent of motive power and running gear, and still am a practical as well as superintending mechanic.

3 X. *Ans. to 3d Cross-Int.* I have never been examined as an expert, although I have been called upon to express my opinion as to machinery, under oath.

4 X. *Ans. to 4th Cross-Int.* For nineteen years it has been my daily business to examine, build, repair, devise, and construct railroad machinery, including locomotives and cars, and to compare together the advantages and disadvantages of the various machines and improvements that are brought forward, and to investigate and determine the principles of their construction and operation, and to act, and to require those under my direction to act upon the opinion thus formed.

5 X. *Ans. to 5th Cross-Int.* It has been my duty for many years to attend to the construction and arrangement of the running gear of the Boston and Lowell Railroad.

6 X. *Ans. to 6th Cross-Int.* I consider myself well acquainted with the subject, and capable of judging of the proper construction and operation of cars at all the rates of speed yet attained, and able to compare and judge of all descriptions of railway machinery.

7 X. *Ans. to 7th Cross-Int.* We ought to avoid all the friction we can, on the curves and on the other parts of the road; that is, we ought to construct the truck so that having sufficient steadiness of motion, it will pass the entire road, including straight track and curves, with the least practical amount of friction. Of course any one would see that by this I don't mean to say that if a truck should be made so that it would pass the curves with very little friction, but yet on every other part of the road cause very great friction, that I think such a truck a good one; but what I mean is this, that you must watch the action of the truck on all parts of the line, and that truck will be the best which has the greatest steadiness of movement and the least aggregate amount of friction.

8 X. *Ans. to 8th Cross-Int.* If this question means that wheels offer least resistance to the guidance of the rails in trucks which swivel most easily from one side of the track to the other, then I answer in the negative; and the reason is because the trucks which swivel so readily are always wobbling about, from side to side, and grinding the flanges against the rails.

9 X. *Ans. to 9th Cross-Int.* Far from it. We have had a great deal

of experience in the subject of the more or less remote position of the wheels in the four and eight-wheel cars. It used to be the fashion, in old times, to place the wheels quite near together; but the fashion has changed, and we have returned to the same plan that was adopted in the first eight-wheel cars built upon the Boston and Lowell Railroad. That is, we begun in 1840, (the date of our first eight-wheel car,) to place the axles of the wheels as far apart as the distance across the rails. We have since placed them a little nearer, in some instances; but have found *that* distance decidedly the best in practice. As you bring the wheels nearer, the truck wabbles more on the track, its motion is unsteady, and the friction between the rails and wheels is *increased*. It is a great mistake to suppose that the friction upon curves diminishes as the wheels are brought together. The English four or six-wheel second class cars, with rigid axles united to the frame, are now extended so far as to carry eighty passengers each, and it is considered better to use such cars on the roads than shorter ones for this purpose. There has been a great misapprehension upon this subject among theoretical men, partly owing to the fact that they did not take into account the shape of the flange.

10 X. *Ans. to 10th Int. Cross.* No, sir. Certainly not. A prudent engineer would not trust a truck with too great freedom of motion. Trucks must be controled in the freedom of their motions. We use side bearings, check chains, draft by the king-bolt, to control the freedom of motion of the truck, as well as for other purposes; and to control its power to fly up when reaching any of the inequalities of the track, we also use the resistance of the body itself, communicated through the side bearings, to control the action of the wheel springs, and through them the wheels themselves. Those trucks which have the greatest freedom to be shuffled over from one side of the track to the other, and twisted most readily by the irregularities of the road or the junctions of the rails, will have the flanges of the wheels most frequently brought into violent contact with the rails; so that the aggregate of friction on the whole line will always be greatest where the trucks have the greatest freedom of motion. To get the least friction the trucks should not swivel so readily but that they will, when once turned by the rails, keep their position in spite of little irregularities of the road, until the course of the track changes; and in this way the truck will follow a B line between the rails when straight, and the true curve when the track is curved; but to do this you must check the freedom of the truck in swiveling, and control it as I have before said.

11 X. *Ans. to Int. Cross 11th.* My reading, and practical experience and information I have derived from others, enable me to compare the present state of railroad engineering with that existing previous to 1830, so far as relates to railroad machinery, including cars.

12 X. *Ans. to 12th X Int.* The more steadily you can make cars run the better. And I think it important not only to make them run more steadily than the old-fashioned four-wheel cars did, but more steadily than any cars *now* made *can yet* run. It is a dictate of common sense, that a car that has more than two wheels upon it, or more than one axle, should have these axles placed at or somewhere near the ends. If the axles were placed near the middle, it is probable that when passengers came to get in, it would upset while standing still, and



much more by the inertia of the body, in the shocks occasioned by the sudden stopping and starting of the train.

The distance at which the axles should be placed would depend upon the length of the body, the radius of the curves, the angles of the switches and turn-outs, the couplings, &c ; but the steadiness of motion would not depend upon the length of body, but upon the weight, height above rails, couplings, and various other circumstances.

13 X. *Ans. to 13th X Int.* It is, as cars are commonly used.

14 X. *Ans. to 14th X Int.* It is no consequence that all the trucks in a train should have an equal amount of freedom of motion. Each truck should have freedom enough. Those that have too much should be limited. For instance, the last truck in all trains behaves worst, and the last car is generally the first to get off the track. The reason is, that the last truck, not being controlled by any car behind it, has too much latitude of movement, consequently is thrown about as circumstances direct. It would be a bad job indeed to give all the trucks in a train the same liberty that the last one has.

15 X. *Ans. to 15th X Int.* There has been a good deal of dispute which is the best mode of draft of trains, whether by the king-bolt or by the perch. Many prefer drawing wholly by the trucks. I think that one mode or the other is best according to circumstances ; but of one thing I am certain, that drawing by the trucks gives sufficient freedom of motion to the trucks for all practical purposes.

This mode of draft has been and still is in use on some of the oldest and best railroads in Massachusetts, and I am not sure but that we shall all adopt it again.

16 X. *Ans. to 16th Cross-Int.* The drawing shows more bearing surface between the bolster than model "B," I judge, but the car described in the patent requires all the weight of the load to be placed on the centre of the bolsters ; I should judge model "B" about half way between the patent and the drawing.

17 X. *Ans. to 17th Cross-Int.* No, sir, I do not see any mode of attaching the draft provided for on the model.

18 X. *Ans. to 18th Cross-Int.* There is a form of spring and a mode of constructing the truck, particularly described by Mr. Winans, in his specification ; but I suppose them no more essential than any other substitute amounting substantially to the same thing.

19 X. *Ans. to 19th Cross-Int.* Springs or something equivalent must be used on passenger cars, or wherever ease of motion is desirable.

20 X. *Ans. to 20th Cross-Int.* The description and drawings which I understood were inquired of in the fourteenth direct question, were those of the patent of E. and W. Chapman, and not of the "Chapman Engine" merely. I don't consider them as descriptions of any engine whatever, because there is no method of locomotion drawn or described. All the patentees draw or describe, is only an eight-wheel or six-wheel car or carriage, to which an engine or any other motive power may be added, and which is capable of carrying the motive power in the body of the car. That which the patentees claim as their invention, is only a mode of applying a motive power to a six or eight-wheel car ; the patent is not for the engine that propels the car ; it is not for the car which is to bear the engine or motive power. The car is fully shown and described ; the engine is not ; and I don't see why you should call the



eight-wheel car an engine, any more than a common eight-wheel passenger car that carries the engine at one end, as the steam omnibuses now do.

As to the mode of applying the draft, that is shown in the drawing. It was through an aperture in the platform, over a pulley inserted in it, by a knotted rope or chain, which passed over the pulley in the platform, then over the windlass in the body of the car, or at one end, then down again under the body of the car, over another pulley in the platform, opposite the one first mentioned. The rope was fastened at each end to a fixed point, so that when the windlass revolved, either by hand, horse, or steam-power, it compelled the car to advance just as a man in a boat compels the boat to advance by pulling on a rope made fast to a post. The point at which the draft acted was in a line passing lengthwise through the centre of the platform; and this point of draft was either at the end or in the centre of the platform, according to the position of the pullies.

21 X. *Ans. to 21st Cross-Int.* In Tredgold's book the draw-link, shown on model "A," is not represented in the sketch of the eight-wheel car on Plate IV. This same mode of drawing being shown in other cars in the same book was the reason why I consider the model a correct one.

22 X. *Ans. to 22d Cross-Int.* There is a description and drawings by which the trucks can swivel laterally in Tredgold's book. The Plate IV, and description on page 179, are the leading references I should give.

23 X. *Ans. to 23d Cross-Int.* The Allen carriage, as I judge of it by the model, has two swiveling trucks under one body or frame work, having sufficient freedom of motion to allow their being guided by the rails. The flanges of the wheels are pretty near together (though this, in my opinion, is not material). The trucks are placed near each end of the body or frame work. It, therefore, involves all that is essential or substantial in the car described in Winans's patent. It is the employment of two trucks swiveling under one body that introduces all that is really essential in the eight-wheel car, and in its change from the common four-wheel car. When once you have the two trucks under one body, you may place the wheels close together or far apart, according to circumstances, or lengthen out the body as much as you please; there is nothing new in principle produced by such change, as I have said before. But you may alter the construction of the truck, or the mode of connecting it with the body, in various ways, and each way may have more or less advantage.

If the question means "by any part or parts of Winans's invention" those peculiar modes of constructing the truck and connecting it with the body, which make his car any different from those made before his day, such as *bearing all the weight on the centre of the bolster*, which is the centre of the bearing carriage without side-bearings, and the constructing of the trucks without any thing that I should call a truck-frame, that is to say, uniting the axles by long springs—these devices are not in Allen's carriage; for Allen's carriage has side-bearings and truck-frames, without such long springs.

24 X. *Ans. to 24th Cross Int.* In answer to this question, I must refer to my last answer, and say further, that the Quincy car embraces all

that is material in the car described in Winans's patent. The differences in detail are these: Winans's has no side-bearings; the Quincy car has. Winans describes a truck without a frame; the Quincy car has a truck-frame. Winans recommends placing the flanges of the wheels very close together; the Quincy car has not them so placed, but the bearing points of the wheels on the rails are as far apart as the gauge of the track. The size of the wheels is different, as I suppose. The wheels used on the Quincy car, I am told, were 18 inches in diameter. (This is the same size as some few of the wheels formerly used on the Boston and Lowell Railroad.) In both the cars the trucks are placed at or near the ends of the platform.

25 X. *Ans. to 25th Cross-Int.* I don't see how any intelligent man, who was conversant with the subject in 1830, and knew what had been done before that time, could well help knowing what the requirements and characteristics of a railroad car were, to enable it to run safely and smoothly over railroads, in the manner supposed in the question. Railroads were not new at that time, and four-wheel cars had been run at rapid rates, and the practical consequences of running fast were well known. The effect of curves upon the wheels were well known practically and given in books, and the leading means of avoiding friction on curves by the wheels, were well known and in public use, such as *raising the outer rail*, and making the tread and flange of wheels in a perpendicular form.

The use of springs, applied in various ways, was described by the books and in general use before 1830, for the purpose of enabling the cars to run more smoothly over the inequalities of the road, with as little jolt as possible. The substitution of two swiveling trucks under one body or platform had been invented and described in Chapman's patent and Tredgold's book, and put in use, as I believe, in the Quincy, so that a mechanic would have nothing to do but to take two ordinary bearing carriages or trucks (as they usually had springs) and place them under one body swiveling in the same manner as pointed out by Allen, Quincy, Chapman, or Tredgold, and thus constructed would contain all the essential requirements and characteristics of the cars now in use. It is true that the modern cars contain many contrivances, which are not embodied in Winans's patent, nor in any of the cars I have before mentioned; but these have nothing to do with the great features of the eight-wheel car; they are improvements in detail, and are intended more completely to embody those characteristics and requirements which were very *obvious* to those who had to do with these subjects at that time. Some of these requirements, which were well understood in 1830, have not until recently been answered; for instance, some mode of giving the entire command of the breaks of a train to the engine man, so that he can stop the train in time to prevent accidents. This want was felt particularly as most roads had but a single track. Other requirements are still left, which, in course of time, we may expect to be answered; but every railroad man knows well enough what they are.

26 X. *Ans. to 26th Cross-Int.* I cannot see what difference it makes in the arrangement of railroad car wheels, whether they are firmly fixed to their axles, or rotate upon them.

27 X. *Ans. to 27th Cross-Int.* I am told the draft was by the for-

ward part of the truck, when it was drawn at all; but I don't know from personal knowledge.

28 X. *Ans. to 28th Cross-Int.* I do not consider it a matter of indifference whether the draft is applied to the truck or to the body of the car. I have explained what I think on this question in a former answer.

29 X. *Ans. to 29th Cross-Int.* They are.

30 X. *Ans. to 30th Cross-Int.* The draft of the Chapman eight-wheel carriage was applied to the body or platform, in the way I have explained. My authority for the statement is Chapman's patent and drawings. Although I consider that the Tredgold car was drawn by the body as all the cars shown in his book did, yet the mode of draft is not represented on the plate. I don't know how it was with regard to Allen's locomotive, nor as to Fairlamb's, and only what I am told as to the Quincy car.

31 X. *Ans. to 31st Cross-Int.* I think that any mechanic who was acquainted with car building, in the year 1830, and who had either Chapman's patent, Tredgold's treatise, the model of Allen's locomotive, or that of the Quincy car, would learn from them that the wheels in each truck should be about the same distance apart as the width of the track, because this is the way in which each of these cars is made. This is about the best distance for the axles of the wheels to obtain steadiness of motion and avoid unnecessary friction between the wheels and rails on all parts of the road. If this distance is meant by the words of the question "placing the wheels very near together," I should answer in the affirmative. The patent of Winans speaks of the common bearing carriage or trucks in ordinary use at the time of the patent, as having their axles from five to three and one-half feet apart. If the words "very near" mean nearer than that which was the common usage at that time, or three and one-half feet, I do not think that either the model or drawings indicate the use of trucks with axles nearer together than that distance. But I consider it merely a matter of proportion in building the truck, whether the axles were placed three and one-half feet or six feet apart.

32 X. *Ans. to 32d Cross-Int.* The drawings and descriptions referred to would have taught that the body of the car might be extended to any desirable length, when the idea of supporting each body by two trucks was got at. These works and drawings would teach the necessity of making the body about twice as long as the common four-wheel car, in order to give room enough for the trucks to swivel under the body without clashing. They would not teach how much longer the body might be extended, and I find nothing in Winans's patent that gives any limit of that sort. I do not consider that giving great length to the body will in fact give great steadiness of motion to the eight-wheel car. Its steadiness of motion depends on various circumstances which are independent of such length.

33 X. *Ans. to 33d Cross-Int.* The drawings and descriptions inquired of would show very clearly the best mode of uniting the trucks with the body; that is, by king-bolts, used in connection with side bearings. Although this mode of connection does not give the greatest freedom of motion possible to the truck, yet it is the best mode of construction, and is what has been sanctioned and adopted by about all the good

mechanics in the country, and it give [?] all the freedom of motion to the truck that is consistent with safety. As to the draft, I have before told you what I think upon that subject.

34 X. *Ans. to 34th Cross-Int.* All the eight-wheel cars drawn or described, were such modifications and arrangements as were capable of being run at high velocities.

35 X. *Ans. to 35th Cross-Int.* No, sir. One of the purposes of all eight-wheel cars (including those inquired of,) was to carry great weights, and to divide those weights as equally as possible; but these which were drawn or described by Chapman, Tredgold—and the same is also true of the Allen and Quincy carriages—was for the purpose of being able to use longer bodies, to carry greater weights, or more passengers, to turn switches and curves, and to pass all the inequalities and variations of railroad tracks. These uses are apparant and self-evident, not only from the language of the descriptions, but from the character and arrangement of the parts of the car, which evidently adapts them to all these purposes. The language and drawings must be taken altogether and not in quotations or sentences in order to see the objects of inventions.

36 X. *Ans. to 36th Cross-Int.* I cannot answer the question from personal knowledge.

37 X. *Ans. to 37th Cross-Int.* I have not been so employed by any person or corporation, and am in no way connected with the case, except as a witness.

38 X. *Ans. to 38th Cross-Int.* I am Superintendent of Motive Power of the Boston and Lowell Railroad. That Company uses eight-wheel passenger cars, and has done so many years.

39 X. *Ans. to 39th Cross-Int.* I have not formed the opinion that the letters patent of Winans are invalid. I suppose he has a right to build his elastic truck by uniting the axles by long springs. I never knew such a truck to be in use on any railroad before or since 1834; that is a truck so made and so connected to the body; but I don't profess to be a judge whether this would or would not invalidate his patent.

40 X. *Ans. to 40th Cross-Int.* I am not a member of any association of railroad superintendents.

41 X. *Ans. to 41st Cross-Int.* I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, or any of them, before they were put to me by you, sir.

And in answer to further interrogatories on the part of the Respondent:

[Further interrogatories, page 659.]

1st Add. *Ans. to 1st Add. Direct Int.* All I know is that Mr. Winans was about here, in Boston, from time to time—that his business brought him to all the railroads, as he had wheels to sell. I don't see how he could help knowing what everybody knew, that knew anything about railroads; and that is, that for years past the eight-wheel cars were in common use on all the railroads—such as are now used. I never heard Winans say a word to give me to understand that he objected to such use of said cars, or that he had any patent for it, or any right or reason



to object to anybody's using them as they pleased, until lately I heard that he had got into a law suit about it.

*2d Add. Ans. to 2d Add. Direct.* This substitution of longer for shorter bodies cannot introduce any new mechanical principle or new mode of operation into the Chapman, Tredgold, Quincy or Allen cars. This is a mere change of proportion.

*3d Add. Ans. to 3d Add. Direct.* Certainly not. If any common mechanic had before him a body thirty feet long, with two trucks under it, and wanting to carry twice the number of passengers, would double the length of the body. Such substitutions are the daily business of mechanics; they are constantly required to change the dimensions of things on which they are at work.

*4th Add. Ans. to 4th Add. Direct.* There is not; on the contrary, one of the objects of employing two trucks in Tredgold's car was to enable him to use a longer body, and to give it a capacity of being lengthened out to any desirable measure by carrying the trucks farther apart.

*5th Add. Ans. to 5th Add. Direct.* I make the same reply as to the Chapman patent.

*6th Add. Ans. to 6th Add. Direct.* I repeat the same views as to Allen's carriage.

*7th Add. Ans. to 7th Add. Direct.* There is no reason whatever for placing the wheels of the Quincy car equidistant from each other; their happening to be equidistant is the result of the length of platform used. The platform might be lengthened, and the trucks separated just as well; such changes require only a change of proportion, not anything new in principle or in its operation on the roads.

*8th Add. Ans. to 8th Add. Direct.* I am not quite sure that I understand what is meant by the "mechanical theory" of Winans; but if it means the mechanical theory which was at the foundation of the eight-wheel car, all these cars are alike, both those made before and after Winans's patent, including that described by him. They all have two trucks swiveling under one body. If by Winans's theory you mean those notions stated in his patent, in which he differs in some respects from other eight-wheel cars, and in accordance with which he has accommodated the eight-wheel cars he built, I think that his theory is different from the eight-wheel cars in common use; and the practical results of these differences are very important and essential, as I have said once or twice before, since such a car as Winans recommends could not, according to my judgment and experience, be safe or useful, and would not accomplish any of the results for which they were intended by the inventor.

*9th Add. Ans. to 9th Add. Direct.* Winans says nothing of the kind in his patent, from which I should infer that a very long body was recommended by him; but on the contrary he says that the benefits of his invention are to be employed independent of the length of the body, it is supported at both ends, or something to that effect.

*10th Add. Ans. to 10th Add. Direct.* I have said, in different parts of my testimony, that it will not answer to give the trucks either the greatest possible freedom of motion to conform to the rails, nor any thing approaching that degree of freedom.

I think I have said enough to make my experience on the subject plain. The trucks must be kept steady on the track, at all events.

And in answer to additional cross-interrogatories on the part of the Plaintiff :

[Further cross-interrogatories, page 660.]

*1st X Add. Ans. to 1st Add. Cross.* The theory of Winans, as explained in my answer, *may* mean either of two things, both of which I have there stated ; I mean by Winans's theory, the plan upon which he builds his truck, connects the axles of his wheels together, and connects the body to the trucks. The elastic truck-frame and the exclusive centre bearings are peculiar to his theory. So also is the extreme closeness of the wheels in each truck ; and in all these respects his theory is different from that on which the cars now in use are constructed.

*2d X Add. Ans. to 2d Add. Cross.* Of my own knowledge I cannot answer.

*3d X Add. Ans. to 3d Add. Cross.* So far as I had knowledge of rail-ways, prior to 1830, and ever since that time, they have been so constructed as to require a distribution of the weights to be borne upon them. The number of driving wheels in locomotives has been doubled for the purpose of distributing its weight.

*4th X Add. Ans. to 4th Add. Cross.* According to my information there were two, the "Stockton and Darlington," and the "Liverpool and Manchester."

*5th X Add. Ans. to 5th Add. Cross.* Generally so, but there were some exceptions, according to my knowledge and belief.

*6th X Add. Ans. to 6th Add. Cross.* On some roads the speed was less, on others more, as I believe.

*7th X Add. Ans. to 7th Add. Cross.* I have designed and built railroad cars, both with four and eight wheels, for many years past, and they have run and are still running on the Boston and Lowell Railroad. I cannot give the date of each car so designed, but I can give the date of the first eight-wheel cars built or used on the Boston and Lowell road. This was in the spring of 1840, in April. The cars then built were put in use, run for many years, and are still occasionally used on the road. Some of the original cars, as they were originally built, are now at the depot, and to enable you to understand fully the shape and proportions of the cars thus first used, I desire to annex to my answer a careful drawing, taken by exact measurements from the first eight-wheel car made and used upon the road. [This drawing is annexed by the Commissioner, and is marked "B. F. Hallett, Commissioner, to be annexed to answer of Godfrey B. King, to 7th ad. cross-interrogatory."]

The eight-wheel cars first made upon the Boston and Lowell Railroad were completed and in operation in April, 1840. I never knew or heard of the existence of any patent on the eight-wheel car ; or of Winans or of any one else out of Massachusetts having ever built an eight-wheel car, at the time when the first cars were built, nor until years afterwards.

On the drawing annexed to this answer there are two arrangements of springs, the one on the left hand truck is that we first adopted, the one on the right hand we subsequently adopted. There was no part of the weight of the body borne on the centre of the truck or bolster, but the weight of the weight of the [?] body was borne upon outside bearings, called roller-bearings, as represented in the drawing at B. We previously tried to bear the weight, in part, upon the centre, and found

it would not answer at all, and immediately placed the bearings as above stated, wholly on the side. We also used check chains, to prevent the truck from swiveling too far (shown at A.) The draft was originally by the truck-frames, with bunters on the four corners of the truck-frame. When we afterwards adopted centre bunters placed upon the middle of each end of the platform, we then adopted the draw-spring couplings and centre bunters united into one, as now used; and the draw-spring couplings drew from the king-bolt, as is the case on all the cars now used by the road.

The bearings of the body on the truck were seven feet four inches distant from the ends of the platform. The wheels were thirty-six inches in diameter; the length of the body was thirty feet four inches; the platform, two feet eight inches, each making the whole length of body and platform, thirty-four feet ten inches. The distance of the centres of the axles of the wheels in each truck was four feet and five inches; and the distance between the flanges in each truck was fourteen inches.

This distance of the axles of the wheels is very nearly the same as has been used ever since, until lately the distance has been increased, and is now generally from four feet seven, to four feet eight inches; subsequent experience having shown the importance of increasing the distance between the axles, although it is cheaper to build with the wheels nearer together, as has been done on freight cars on some other roads, to save expense. I have not designed any eight-wheel freight cars whatever, as all the freight cars used upon our road belonging to the Boston and Lowell Railroad Company are four-wheel cars. These eight-wheel cars thus originally made upon our road, have been in use down to the present time, and have answered the purposes perfectly. They have never, in any instance, to my knowledge, run off the track, and are still considered as safe as any cars we have.

No cars whatever have ever been designed or used on the Boston and Lowell Railroad upon the plan laid down by Mr. Winans's patent, but they have all been substantially the same as the one in the drawing, having *no* bearing upon the centre, but all upon the sides of the truck; all having solid rigid truck-frames, capable of keeping the wheels square upon the track, and in no instance connecting the axles of the wheels together by long springs, nor in any case having the flanges of the wheels very close together.

G. B. KING.

#### DEPOSITION OF GEORGE S. GRIGGS.

I, George S. Griggs, of Roxbury, in the District of Massachusetts, engineer, aged forty-seven years, on oath depose and say, in answer to interrogatories proposed to me on behalf of the Respondent, in the suit of Ross Winans *v.* the Eastern Railroad Company :

[Interrogatories, page 649.]

1st. *Ans. to 1st Direct.* My name is George S. Griggs; my age 47 years; place of business is Boston and Providence Railroad; residence,

Roxbury. I am superintendent of motive power and of construction of engines, cars, and other railroad machinery.

2d. *Ans. to 2d Direct.* I have been engaged in this line of business, that is, on machinery, ever since I was a boy.

3d. *Ans. to 3d Direct.* I am.

4th. *Ans. to 4th Direct.* I have.

5th. *Ans. to 5th Direct.* I have examined it; it is correct.

6th. *Ans. to 6th Direct.* One body or platform, and two four-wheel trucks, capable of swiveling under it, in a position proper to support it.

7th. *Ans. to 7th Direct.* They have; swinging bolsters, safety beams, spring-draw couplings, and a great variety of other things.

8th. *Ans. to 8th Direct.* They are so constructed; about seven feet from the end of the platform, four from end of body.

9th. *Ans. to 9th Direct.* They do; to keep the body steady, and the truck steady also; and to support the body under the side framework.

10th. *Ans. to 10th Direct.* They are; to prevent the truck swinging too far, in case of running off the track; and for safety in case of breaking a wheel.

11th. *Ans. to 11th Direct.* No, sir.

12th. *Ans. to 12th Direct.* They are not safe, for many reasons. In case a spring breaks destruction is unavoidable, as there is nothing to hold up the body or keep the wheels together; also, the springs cannot keep the axle parallel; also, the springs cannot protect the truck from twisting on the track; also, it is not possible to apply a brake to such a truck with safety. Also, a spring itself is not reliable after being some time in use; this I have long noticed in my experience. There are also other reasons why this truck is not safe.

13th. *Ans. to 13th Direct.* I have examined the drawing. There are numerous differences between the drawing and the specification. What I suppose are the most important differences are those in which the improvements of Mr. Winans are claimed to consist. The drawing does not correspond with the specification on either one of the things which the patent is for.

14th. *Ans. to 14th Direct.* I have examined Chapman's patent.

15th. *Ans. to 15th Direct.* I have examined the model. It correctly represents the running gear.

16th. *Ans. to 16th Direct.* I have no doubt he would.

17th. *Ans. to 17th Direct.* It has.

18th. *Ans. to 18th Direct.* It has some less.

19th. *Ans. to 19th Direct.* It may.

20th. *Ans. to 20th Direct.* I have examined Tredgold, and I do find such a car there described and shown.

21st. *Ans. to 21st Direct.* There are two four-wheel trucks swiveling under one body, and connected with the body with a vertical axis, a king-bolt. It operates the same as the common eight-wheel car.

22d. *Ans. to 22d Direct.* I have examined model A; it is correct. Model C is not correct, because the trucks do not swivel.

23d. *Ans. to 23d Direct.* I consider them substantially identical in their mechanical principles and modes of operation, excepting that



Tredgold bears the whole weight of his load on the centre of the bolster, while the Eastern Railroad cars bear it exclusively upon side bearings.

*24th. Ans. to 24th Direct.* The Tredgold car will answer the same purposes as Winans says he wants to answer by means of his improvements.

*25th. Ans. to 25th Direct.* I have seen the Fairlamb patent and drawings. They show all that is material in the eight-wheel double-truck car. There are some difference [?] in the details, and some so-called improvements.

*26th. Ans. to 26th Direct.* Taking Fairlamb's drawings of an eight-wheel car together with what is well known as to four-wheel cars, I answer these questions in the affirmative.

*27th. Ans. to 27th Direct.* I have examined the model, but not the drawings; the principles of its arrangement and construction are the same as the ordinary eight-wheel car, and it will answer the same purpose.

*28th. Ans. to 28th Direct.* I have examined the model; it consists of a platform with two swiveling trucks under it, and side bearings. The rest of the question I answer in the affirmative. [The model "E. R. R. No. 1, B. F. Hallett, Commiss." is the one referred to by the witness.]

*29th. Ans. to 29th Direct.* All that is material to the construction of an eight-wheel double-truck car is there shown. The car differs in some of its details from Winans.

*30th. Ans. to 30th Direct.* Certainly he would, for they are exactly the same.

*31st. Ans. to 31st Direct.* I have examined these books; the mode of drawing by the body was well known long before 1830.

*32d. Ans. to 32d Direct.* In those books the distance of the treads is less than the width of the track; in the best cars now in use, it is about equal to the width of the track.

*33d. Ans. to 33d Direct.* They were in Allen's model; and in Woods, published in 1831.

*34th. Ans. to 34th Direct.* They were.

*35th. Ans. to 35th Direct.* I answer, no, sir, to all these questions.

*36th. Ans. to 36th Direct.* It is not; this change may be made by substituting larger wheels, or bringing the old ones closer together.

*37th. Ans. to 37th Direct.* It is, because all the leverage of the rails on the truck is applied on those points.

*38th. Ans. to 38th Direct.* It is; without this there is no safety in the trucks.

*39th. Ans. to 39th Direct.* I dare say I do, but I don't know what fact is inquired for.

*40th. Ans. to 40th Direct.* The theory of Winans for constructing his car, is very different from that on which the Eastern Railroad cars and those in common use are built and operated. That difference is, in my opinion, of the utmost importance practically.

And in answer to cross-interrogatories proposed on the part of the Plaintiff:

[Cross-interrogatories, page 654.]

1st X. *Ans. to 1st Cross.* Originally I was apprenticed to a cabinet maker's trade. Ever since I was twenty-one years old, I have been at work on machinery—inventing, planning, drafting, and constructing machinery of various kinds. I have been superintendent of the locomotive power, cars and machinery, on the Boston and Providence road ever since 1834. I have been perfectly familiar with the cars and locomotives introduced here in Massachusetts, from the commencement of the Quincy road to the present time. I have always been in the habit of examining machinery of various descriptions, in order to understand their principles of working.

2d X. *Ans. to 2d Cross.* For nineteen years last past, the constructing of cars and engines has been my exclusive business. I have built fifteen of the locomotives now used by us, and rebuilt most of the others. We built many of the cars used on our road. The first four-wheel cars built in Massachusetts, were built at the shop of the Boston and Providence Railroad. I built the first eight-wheel railroad passenger car that was built in Massachusetts.

3d X. *Ans. to 3d Cross.* I have been examined as an expert in court, upon the subjects connected with machinery.

4th X. *Ans. to 4th Cross.* I have, to a very great extent, not only in the business of the Boston and Providence Railroad, but I am frequently called on to give my opinion on mechanical subjects.

5th X. *Ans. to 5th Cross.* It has.

6th X. *Ans. to 6th Cross.* I answer this question in the affirmative.

7th X. *Ans. to 7th Cross.* All useless frictions should be avoided. The only question is whether in getting such a truck as has the least practicable friction between the flanges and rails, you don't spoil the truck.

8th X. *Ans. to 8th Cross.* The more the trucks resist any changes in their direction, the more will they keep in their proper position, when once put right by the rails. It is true that there is more friction in turning the truck just at the moment when the turning is done; but there is far less afterwards, because the truck don't wobble about. The friction caused by turning is not one tenth part of the friction that would be caused by wobbling, if the trucks were too free to turn.

9th X. *Ans. to 9th Cross.* The wheels of a four-wheel car and of the trucks of an eight-wheel car, will not run upon curves nor on a straight track with less friction between the flanges and the rails, the nearer the wheels are to each other. This is plain, both from common sense and from practical experience. When the wheels are quite near together, the truck loses its leverage, whereby it is enabled to conform to the track. The truck wobbles about on curves and on straight rails. The truck has not sufficient base to run steady.

It creates great unnecessary friction between rails and flanges. It makes the car body ride unsteady. I mean by having the wheels too near, having them as near as directed in Winans's specification and drawings. I have found for passenger cars the nearest that it will answer to put the wheels together is so that the centres shall be about the same distance apart as the width of the track, and you may extend that distance with great advantage.

On the Boston and Providence Road the curves and turnouts are as

short as on any other road in New England ; and we have after much experience adopted and built locomotives with six wheels all flanged, and all with no swiveling truck, but all united to a rigid frame ; the centre of the front and rear wheels being at least twelve feet apart. These engines are used for running our express trains, at the highest rates of speed. I cannot perceive any difference between these engines and the ordinary locomotive with a swiveling truck in their friction in passing curves, whether they are pushed by hand or propelled by steam. I have ascertained this fact by experiments. The same fact is true as to the cars. When the wheels are widest apart there is less friction between the flanges and rails than when they are nearer together, both in passing curves and upon the straight track. The great reason for building trucks in freight cars with the wheels nearer together than in passenger cars, is not because there is less friction, but because you can place a short truck nearer the end of the platform, and it is easier and cheaper to build a short truck sufficiently stout than a long truck. And so in passenger cars, the trucks would have been made longer if it were not for the necessity of keeping the wheels so far back as not to interfere with the steps, and so near the end as not to let too much of the car overhang. In many of the cars on our road the distance of the wheels, from centre to centre, is between five and six feet ; and these cars do not encounter any more friction between the flanges and rails in passing curves than those where the wheels are much nearer together. The axles of the four-wheel car in use on our road, before eight-wheel cars were introduced, were from six to seven feet apart. Among the first of the eight-wheel cars I built were some which were constructed by using these four-wheel cars, putting two and three bodies together, and using the old running gear swiveling under them for trucks ; and so far as friction between the flanges and rails, these had as little as any cars we ever used since. The trucks, with the wheels wide apart, go much more steady on the track, and don't shift across, from one side to the other. There is no difficulty in their getting round curves without friction between flange and rails. Locomotives are built by Mr. Winans himself, in which the centre of his wheels, united to the main rigid frame, are at least twelve feet apart ; and whatever other difficulties there were, there were none occasioned in passing curves.

I therefore say, without hesitation, that in four-wheel cars, and in the eight-wheel cars, and in locomotives, that bringing the wheels quite near to each other causes the useless friction between the flanges and rails upon all such railroads as I have any acquaintance with.

*10th X. Ans. to 10th Cross.* Wheels of the trucks of eight-wheel cars will not (independently of other considerations) run upon the curves and inequalities of the road and yield to the guidance of the rails with the least friction, when the trucks have the greatest freedom of motion, which is the case when the wheels are very close together, and all the weight is thrown upon the centre of the truck, and not upon the side bearings. Then the motion is very unsteady ; they wobble about from one side of the track to the other ; they suffer great unnecessary friction between the flanges and rails. The more often the flanges hit the rails the more the friction increases ; the more straightforward the truck moves, the less the friction ; and if the wheels are placed at least five feet apart,

from centre to centre, there will be much less friction than if placed three or three and-a-half feet apart. It is necessary, in order to avoid friction between the rails and wheels, to control the freedom of the motion of the trucks in various ways—by side bearings, by the mode of draft, by the couplings on the cars, &c.; and, in fact, the freedom of motion of the trucks is actual use, not only, as before stated, by also by [?] the action of the brakes, when applied, &c. It is only by properly limiting and controlling the freedom of motion of the trucks that useless and dangerous friction is avoided.

*11th X. Ans. to 11th Cross.* I am, both from reading and from information derived in the course of my business, and from my experience since 1834.

*12th X. Ans. to 12th Cross.* It always was and always will be important to have cars run as steadily as possible. In the earliest period of the Boston and Providence Railroad we used to place the axles of the wheels near the ends of the cars, in order to obtain steadiness of motion. I think it necessary to support the body somewhere near the ends, to secure steadiness of motion; but steadiness of motion does not depend upon giving great length to the body of the car. This depends on the weight of the cars, and its load, the height of the load above the rails, the construction of the tracks, &c. Some bodies of four-wheel cars will run as steady as eight-wheel cars, if properly built and properly coupled.

*13th X. Ans. to 13th Cross.* Yes, sir.

*14th X. Ans. to 14th Cross.* It is not essential, in order to give freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them; on the contrary, when the draft is applied directly to the frame of the trucks, they have sufficient freedom of motion for all useful or practical purpose. From 1838 to the present time, that is from the first introduction of eight-wheel cars into Massachusetts to this day, we have used that mode of draft; the draft is by the forward end of the frame of the truck. Ten of our present eight-wheel passenger cars draw in that manner. This mode of draft has some advantage over the other modes of draft. It is decidedly preferable to all other modes when cars are drawn singly. This mode of draft in trains assists the trucks in swiveling without touching the flanges against the rails, because the draft itself gives the right direction to the trucks. All the works in a train, when the draft is through the trucks, have full enough of motion. There is no difficulty on that account.

*15th X. Ans. to 15th Cross.* The mode of draft in a great number of our cars has been by the trucks, and this mode was used for many years on the cars of the Maine Railroad, till they adopted the mode of drawing by the king-bolt, which enables them to adopt their draw and buffer spring, making one spring answer both purposes. The convenience of the apparatus has induced many car builders to give up drawing by the frame of the trucks and to adopt this draw and buffer spring.

*16th X. Ans. to 16th Cross.* The model B represents more bearing surface than the specification, and less than the drawing.

*17th X. Ans. to 17th Cross.* The model shows no mode of draft.



18th X. *Ans. to 18th Cross.* I do consider the spring truck described in the patent an essential part of Mr. Winans's improvement.

19th X. *Ans. to 19th Cross.* Springs should be used for passenger cars and freight cars.

20th X. *Ans. to 20th Cross.* The Chapmans patent shows a railroad car substantially like model "K." The draught was applied by a rope or chain to the platform of the car, near the middle of the end of the platform. The rope passed through the platform over a windlass.

21st X. *Ans. to 21st Cross.* The draw-link is not represented on the eight-wheel car of Tredgold, but is on the four-wheel car.

22d X. *Ans. to 22d Cross.* There is a provision for enabling the truck of the eight-wheel car of Tredgold to swivel laterally. It is shown in the drawing and description.

23d X. *Ans. to 23d Cross.* Allen's steam carriage contains all that is essential in Winans's car, but they differ in details.

24th X. *Ans. to 24th Cross.* The Quincy car embraces all that is essential in Winans's car, but there is also a difference in details. The Quincy car has two swiveling trucks.

25th X. *Ans. to 25th Cross.* In 1829 or 1830, a mechanic would have known these requirements and characteristics. His means of knowledge would have been his experience in four-wheel cars and in railroads, his knowledge of books, and the eight-wheel car of Chapmans, or Tredgold, or the Quincy car, or the Allen engine.

26th X. *Ans. to 26th Cross.* I do. They are used both ways on railroads.

27th X. *Ans. to 27th Cross.* The Quincy cars draw by the trucks. Sometimes they move down the inclines without any draft at all, as I have often seen them, many years ago.

28th X. *Ans. to 28th Cross.* It is a matter of indifference where you apply the draft; each mode has its advantages. The worst mode of draft is that shown in the drawing of Mr. Winans, viz. by the middle of the end of the body.

29th X. *Ans. to 29th Cross.* They were.

30th X. *Ans. to 30th Cross.* The draft of the Chapmans car is applied to the body, though not represented on each of the figures.

31st X. *Ans. to 31st Cross.* Bringing the wheels of the trucks very near together, will not reduce the friction between the flanges and the rails in passing over curves.

32d X. *Ans. to 32d Cross.* As I have said sometime ago, great length of the body has nothing to do with steadiness of motion.

33d X. *Ans. to 33d Cross.* As I said before, I now say again, that it will not do to let trucks have the greatest possible freedom to conform to the surface of the rails; if you do, it will be followed by much useless friction, and many injurious consequences. As to the draft I have already explained my views.

34th X. *Ans. to 34th Cross.* The drawings and descriptions I have mentioned, show such modifications of four and eight-wheel cars as are suitable to run just as our cars run.

35th X. *Ans. to 35th Cross.* The eight-wheel cars I have testified about, were made and calculated to answer the purpose of dividing the weight on eight-wheels, and also to enable the cars to conform to the curves and irregularities of the rails just as all our cars do.

36th X. *Ans. to 36th Cross.* I cannot answer this question from my personal knowledge.

37th X. *Ans. to 37th Cross.* I have not been so employed, and have nothing to do with the case but to tell the truth.

38th X. *Ans. to 38th Cross.* I am superintendent of motive power and cars, &c. on the Boston and Providence Railroad, and this company use many eight-wheel cars, and four-wheel cars also, both for freight and passengers.

39th X. *Ans. to 39th Cross.* I think Winans's patent is good for a combination of the centre bearing and the spring truck. But I never saw any such combination in use on cars. I had not formed an opinion previous to examining his letters patent.

40th X. *Ans. to 40th Cross.* I am not a member of any such associations.

41st X. *Ans. to 41st Cross.* I have not seen, heard, or had stated the substance of the foregoing interrogatories.

And in answer to additional direct interrogatories on the part of the Defendant :

[Further interrogatories, page 659.]

1st Add. *Ans. to 1st Add. Direct.* I have been personally acquainted with Mr. Winans since about 1836 or 1837. I have frequently conversed with him about the subjects of railroad cars and other machinery, while he was in and about the depot at the Boston and Providence Railroad. He has frequently been about the shops of the Company where eight-wheel cars were standing about, and knew for years that the Company were constantly using such cars. He used to converse about railroad wheels, cars and engines, but he never alluded in my presence to his having a patent for an eight-wheel car ; nor did he ever, to my knowledge, object to the Company's using these eight-wheel cars, or make any claim on that account ; on the contrary, he used to sell car wheels to us for the purpose of being used on our eight-wheel cars, and saw them when put to that use. I know that he saw them, because we condemned a lot of them that had been put on to the eight-wheel passenger cars ; we got Mr. Winans to come out to Roxbury to look at them on the cars ; he told us to take them off, and he would send others to supply their place, and he did so. If Mr. Winans had ever suggested that he had any claim to any improvement on our eight-wheel cars, I should certainly have noticed and remembered it. I never heard of his having a patent until after the trial at Canandaigua.

2d Add. *Ans. to 2d Add. Direct.* No, sir.

3d Add. *Ans. to 3d Add. Direct.* No, sir.

4th Add. *Ans. to 4th Add. Direct.* No, sir.

5th Add. *Ans. to 5th Add. Direct.* No, sir.

6th Add. *Ans. to 6th Add. Direct.* No, sir.

7th Add. *Ans. to 7th Add. Direct.* Certainly not.

8th Add. *Ans. to 8th Add. Direct.* There is a great and essential difference.

9th Add. *Ans. to 9th Add. Direct.* No, sir.

10th Add. *Ans. to 10th Add. Direct.* I have already answered in the negative, and stated why.

And in answer to additional interrogatories on the part of the Plaintiff :

[Further cross-interrogatories, page 660.]

*1st X Add. Ans. to 1st Add. Cross.* By Winans's theory, I mean bringing the wheels very close together in each truck, bearing all the load on the centre of the bolster, and making the truck elastic by coupling the axles by long springs.

*2d X Add. Ans. to 2d Add. Cross.* Their speed varied; they were used mostly for freight.

*3d X Add. Ans. to 3d Add. Cross.* They were always so constructed.

*4th X Add. Ans. to 4th Add. Cross.* I believe there were two; one was the Liverpool and Manchester; this is the one I have heard and read most about.

*5th X Add. Ans. to 5th Add. Cross.* Horse power and steam power were both used.

*6th X Add. Ans. to 6th Add. Cross.* No rate could be called average when one train went three miles an hour, and others fifteen or sixteen miles.

*7th X Add. Ans. to 7th Add. Cross.* I have designed four and eight-wheel railroad cars. I designed and built four-wheel cars before any eight-wheel passenger cars were built in Massachusetts. In the middle of March, 1838, I began the first eight-wheel passenger car that ever was built in Massachusetts. It was put on the road in the following September (1838). I am well acquainted with the eight-wheel cars first built by Jeremiah Meyers. Those cars of Meyers's were completed and put on the Lowell and Nashua road, in December, 1838, about three months after my car had been finished, and running upon the Providence road. I never saw Myers's cars till they were completed.

Upon consulting the records of the Lowell and Nashua Railroad, I find that it was on the 28th day of May, 1838, that Messrs. Holbrook and Clark were appointed a committee to procure eight-wheel cars for the road, and it was at that time that the Company first agreed to adopt eight-wheel cars. The Company began to run cars on the 15th of December, 1838.

My first eight-wheel car was therefore begun more than two months before the committee agreed to adopt eight-wheel cars, or have one built. And it was finished about three months before Meyers finished his first car for them. The first car that was built by me has been running and is still running on the road, from that time to the present. The car has not been altered from the day it was completed to the present time, except the foot board is put on the body instead of the truck. It was built of two bearing carriages or trucks, united to the body by swiveling pins and side bearings; it draws and still draws by the truck. I have caused exact drawings thereof to be made of this car within a few days, and I now desire to have the same annexed to my answer. [The same is annexed to this answer, and is marked "G. S. G. : B. F. H., Commissioner."] The upper part of the car just as it was originally built; all that has been done to it is to alter the foot-board, and extend the roof over the platform. This has operated successfully to the present time. It carries, I believe, sixty passengers. We use on our best cars now just about the same distance between the centre of the wheels; this car has always gone as steadily, smoothly,

and safely as any car on the road. We have ten cars similar to it on the road at the present time, some of which have been in use for years past. They have never yet met with any accident. There are some of them running every day, and frequently on our fastest trains. Before I designed this eight-wheel car which I first built, I had never seen any eight-wheel cars, nor any description of any one, nor had any one ever been described to me. But as I used to go out to the Quincy Railroad, I may have seen the eight-wheel car upon the road. I have, as before said, repeatedly designed eight-wheel cars since that time, for freight and passengers; so many of them that I cannot tell the number. They are used upon the Boston and Providence Railroad. To some of the cars like the one I first built, we have added the swinging bolster, and with that addition they go as steadily and smooth as any cars upon the road; and the arrangement of the running gear, and its connection with the body, in the first car, was as perfect as on the best cars used on the road at the present time.

GEORGE S. GRIGGS.

#### DEPOSITION OF WILLIAM PEARCE PARROTT.

I, William Pearce Parrott, of Boston, in the District of Massachusetts, aged forty-three years, civil engineer, on oath depose and say, in answer to interrogatories proposed to me in behalf of the Defendant, in the case of *Ross Winans v. The Eastern Railroad Company*:

[Interrogatories, page 649.]

1. *Ans. to 1st Direct.* My name is William Pearce Parrott; my age is forty-three years; I reside in Boston; I am a civil engineer.

2. *Ans. to 2d Direct.* By education and profession I am a civil engineer. For the last ten years I have been connected with the railroads in New England as an engineer, and in that capacity it has been my duty to examine, study and apply the principles of machinery in general, and more especially of railroad machinery.

3. *Ans. to 3d Direct.* I am familiar with the mechanical principles of trucks and cars used upon the Eastern Railroad, which are like those in common use.

4. *Ans. to 4th Direct.* I have examined that specification.

5. *Ans. to 5th Direct.* I have examined the model marked B; it is a true representation of the carriage described in the specification.

6. *Ans. to 6th Direct.* I consider the essential and elemental parts to be the car body, which may be of any convenient length and form for the intended traffic. This car body to be supported upon the rails by two independent bearing carriages or trucks, having four wheels to each truck or carriage. These should be placed far enough from each other to move in accommodating themselves to the curves, without interfering with each other; this attended to, the space between is of no importance provided the car body is strong enough within itself to prevent sagging. The trucks themselves require for construction and organization—1st, a rigid square frame, well braced and framed, to insure the permanent position of the axles relative to the rails; the housings or pedestals for receiving the boxes in which the axles run; the



wheels with their axles; the springs for relieving shocks in a vertical direction; the swing-holster for counteracting the lateral shocks; the side bearings to enable the car body to rest steadily upon the truck-frame; the safety bars bolted to the truck-frame to insure safety in case an axle breaks; the breaks and their appurtenances to check the speed; and the centre coupling by which the truck and body are united; and the draw bars by which one car is connected with the other.

7. *Ans. to 7th Direct.* The eight-wheel cars upon the Eastern Road have side bearings, safety beams, swing transom or centre beam, and brakes for checking the speed of the cars; housings or pedestals for keeping the wheels square in their place; and the frame which supports in place the whole organization—none of which are included in said specification. I refer for further answer to the models marked "E. R. R., Nos. 1 & 2," which correctly represent the construction of the eight-wheel cars upon the Eastern Railroad, and which I desire may be referred to as a part of my answer. [The models marked "E. R. R., B. F. Hallett, Commissioner, No. 1," and "E. R. R., B. F. Hallett, Com., No. 2," are the ones referred to by the witness.]

8. *Ans. to 8th Direct.* They may be so removed. The distance from the end of the platform of the car to the centre of the bearing, is variable; it is usually between seven and eight feet.

9. *Ans. to 9th Direct.* Said cars have side bearings; they are used for the purpose of steadying the cars, and to prevent a too free vibration of the truck. Common experience has demonstrated their necessity, and so far as my observation has extended they are usually used on all the roads in New England.

10. *Ans. to 10th Direct.* Check chains are used. They are placed there as a matter of precaution, in case the truck, from some accident, should have a tendency to move from its proper position.

11. *Ans. to 11th Direct.* Certainly not.

12. *Ans. to 12th Direct.* I do not consider them safe for such trains and carriages as are used in New England; they may do for a light traffic, moving at a moderate speed; but I think the manner of constructing the cars in use here, and before described, is safer and better, under all circumstances. Another objection to their use is the impossibility of applying a sufficient brake to such a truck with any regard to safety.

13. *Ans. to 13th Direct.* The drawing does not represent a car constructed as described in the specification—the long springs connecting the wheels together not being shown, but a totally different mode of connection. The wheels are not placed as near together as possible, they being represented far enough apart to introduce brake blocks between—an arrangement inconsistent with such a position of the wheels as is stated in the specification.

14. *Ans. to 14th Direct.* I have.

15. *Ans. to 15th Direct.* I have examined the model K, and it correctly represents the carriage described in said book.

16. *Ans. to 16th Direct.* I have no hesitation in answering this question in the affirmative.

17. *Ans. to 17th Direct.* Yes.

18. *Ans. to 18th Direct.* The distance is a little less than the width of the track.

19. *Ans. to 19th Direct.* Yes.

20. *Ans. to 20th Direct.* I have examined the work referred to, and find described therein, by the text and a diagram, a general description of a double-truck eight-wheel railroad car.

21. *Ans. to 21st Direct.* The diagram and description describe a carriage supported upon eight wheels; it has a bolster and centre-pin to each truck, upon which the frames turn, to accommodate the wheels to irregularities in the track. Each frame carries four wheels, turning about the centre; and the two trucks of four wheels each carry a long body or car, and it will operate in the same way as the eight-wheel car of the present day.

22. *Ans. to 22d Direct.* Model "A" is a correct representation. Model "C" is not, because it has no centre-pin and admits of no swiveling motion.

23. *Ans. to 23d Direct.* The Tredgold car is the same in essential principle, as the long car now used; viz. fixing the wheels upon carriages placed near the ends of the long car, attached to it by a centre pin, around which the carriages could move to accommodate themselves to the curves of the track and other irregularities of the road. It has, however, no side-bearings, or other appliances now used in constructing long cars.

24. *Ans. to 24th Direct.* It would answer all the purposes set forth in that specification, and would be much safer in use than an arrangement wherein "long springs" are substituted for the proper truck-frame.

25. *Ans. to 25th Direct.* I have. Fairlamb's drawings and specification embrace all the substantial parts of Winans's description, except the peculiar arrangement of the "long springs;" the wheels are placed close together, two trucks, one under each end of the car, turning round a centre pin, by which each truck is attached to the car. It has also described several other matters intended to ease the motion of carriages round curves not embraced in Winans's specification, *and which I believe never came into common use.* Among others, the truck was so constructed as to allow a limited motion to the axles in a horizontal direction—a motion dangerous, and not allowed in the present construction—the boxes being firmly secured to the truck-frame, except the allowance for vertical motion.

26. *Ans. to 26th Direct.* A mechanic of ordinary skill, with the exception noted above (of the axes having motion horizontally), would, from Fairlamb's drawings, construct an arrangement of wheels and carriage substantially similar to the eight-wheel car now in use, having all the requisite freedom of motion to attain the results claimed by Winans.

27. *Ans. to 27th Direct.* I have seen the model, but not the drawings referred to. The arrangement of the wheels in the truck-frame, and the manner in which they are attached to them, and the relative position and manner in which the trucks are attached to the body of the engine, are the same now used in the construction of an eight-wheel car, and will produce all the beneficial results claimed by Winans, and embodied in his specification.

28. *Ans. to 28th Direct.* It is constructed by placing a car body upon two four-wheel trucks, which are fastened to the car body by bolsters and centre-pins, with side bearings, and is substantially the organiza-

tion now used on the eight-wheel railroad cars, and is adapted to the purpose.

I answer the remainder of the question in the affirmative.

29. *Ans. to 29th Direct.* All that is material in the construction of an eight-wheel car, the connection of the ends of the axles by long springs, and the connection of these springs by a bolster, from one to the other, and resting the whole load upon the centre bearing, are arrangements in Winans's patent not embodied in this car.

30. *Ans. to 30th Direct.* I cannot doubt it.

31. *Ans. to 31st Direct.* I have seen these works. Such mode of draft is represented in plate 5, in Woods and in Tredgold (1825.)

32. *Ans. to 32d Direct.* In Wood a little less than the width of the track. Tredgold apparently the same. Strickland the same as width of the track. They conform generally to the present practice.

33. *Ans. to 33d Direct.* I find them described in Wood's treatise (London, 1831) same as now used, and similar to those on Allen's model, in principle, but differing slightly in form.

34. *Ans. to 34th Direct.* It was a well-known equivalent. I do not now remember the works in which I have seen this principle laid down.

35. *Ans. to 35th Direct.* I answer this question in the negative. It would require no invention.

36. *Ans. to 36th Direct.* I do not consider this distance material of itself, as involving a mechanical principle; but am of opinion that the truck would run more steadily if the space between the wheels was increased to one third or one half the diameter of the wheels. There are some trucks so constructed, and I consider it better than to place them nearer together.

37. *Ans. to 37th Direct.* There is an advantage in having a larger distance between the bearing points upon the rails than specified by Winans, for the more equal distribution of weight upon the rails; for the more easily and steadily passing round curves (within reasonable limits of curvature); and to avoid the sudden vertical motion in passing the joints of the rails, communicated to the cars when the wheels are placed too close together.

38. *Ans. to 38th Direct.* The safety of trains running at high speed, depends upon the position of the axles: as they being fixed to the wheels, any material change in their position relative to the track would throw the train off. It is material and essential that they should be firmly fixed to the carriages, so that they should not be able to turn horizontally, unless the truck-frame turn also; or, in other words, that they should be so attached as to remain square with the truck-frame, that the axles may be always parallel.

39. *Ans. to 39th Direct.* I do not.

40. *Ans. to 40th Direct.* I have given, in my previous answers, my opinion upon the prominent parts of said patent, and refer to them in answer to this interrogatory.

And in answer to cross-interrogatories, proposed in behalf of the Plaintiff:

(Cross-interrogatories, page 654.)

1 X. *Ans. to 1st Cross.* I have had experience in the construction, ar-

rangement and examination of various classes of machinery, for many years, in which it has been my chief business to make myself familiar with the laws of physical science in the application to mechanics.

2 X. *Ans. to 2d Cross.* The experience I have had in the construction and examination of machinery, has been derived from the study of civil engineering and mechanics, in their application to the construction of machinery. I have also been in the habit, for many years, of comparing the principles of the construction and operation of machines with each other, and of forming opinions upon which I myself and those under me have acted. I have been conversant, many years, with the construction of running gear of railroads, and the investigation of their principles, and the application of these principles to actual practice; it has been one of the chief occupations of my life. I am familiar with most of the railroads of New England, and with the kind of cars and locomotives used upon them, and have been in the habit of familiar intercourse and comparison of opinions with the leading civil engineers in this part of the country, and have become familiar with the views taken by them upon this class of subjects. I have also personally examined some of the railways in England, as far back as 1831, and cannot hesitate in saying, that I am entirely familiar with the principles of the construction and arrangement of this class of machinery. My experience has not, however, been confined to railroad machinery alone.

3 X. *Ans. to 3d Cross.* I have been examined as an expert in patent causes, more particularly in the class of cases pertaining to railroad machinery.

4 X. *Ans. to 4th Cross.* As I have before said I have, to a great extent, been accustomed to the examination and comparison of machinery, with a view to forming and expressing and acting upon my opinions, as to the substantial identity between different machines and different combinations of apparatus.

5 X. *Ans. to 5th Cross.* I am not a superintendent of any railroad, but it has been my duty as civil engineer to give advice in regard to the construction and arrangement of running gear of railroad cars and carriages.

6 X. *Ans. to 6th Cross.* As I have before said, I am thoroughly and practically acquainted with railroad engineering; engaged in this business all my time. I do fully understand the principles involved in the construction and operation of railroad cars of every kind, and the properties essential to their proper operations under the present condition of railroad construction and engineering. I do know enough of the subject to compare the different constructions of cars, and to judge from them whether they are practically adapted to answer the purposes required of railroad cars, under the conditions of high rates of speed, steadiness of motion, curvatures and inequalities of the road commonly found in the working of railroads in this country.

7 X. *Ans. to 7th Cross.* In my opinion there should be as little friction between the flanges of the wheels and the rails as is consistent with a due regard to the true proportions and proper construction and proper operation of a railroad truck.

8 X. *Ans. to 8th Cross.* The friction between the flanges of the wheels and the rails, in one mode of view [?] this question, may be said to be proportionate to the resistance which the wheels offer to the guid-



ance of the rails; in another sense of the question, the friction will not be proportionate to that resistance. If the question means simply the friction caused by the effort of the rail to change the direction of the truck so as to make it swivel, I answer in the affirmative. If the question means the friction of the flanges upon the rails in passing curves, &c., there is no such relation of proportion between that friction and the resistance. On the contrary, if the truck swivels too easily, there will be more friction of the flanges against the rails than there would be if the track swiveled less easily, and was, therefore kept more steadily on its track.

9 X. *Ans. to 9th Cross.* Nothing is better settled by practical experience, than that the wheels of a truck must be placed sufficiently far apart to enable them to be guided by the rails steadily, and in a direct forward motion; and in order to accomplish this, there must be a sufficient distance between the front and hind wheels. When the wheels are placed very near together, the truck is unsteady in its motion, wobbling from one side to the other, and continually brings the flanges in contact with the rail, thus producing unnecessary friction by the flanges. The nearer the wheels are brought together the greater is this difficulty. For this reason I entirely disagree with the fact asserted, and the reason set forth in the specification of Mr. Winans on this subject; and I answer this question unhesitatingly in the negative.

10 X. *Ans. to 10th Cross.* If a truck has too great freedom of motion, by reason of being allowed to swivel too readily, especially where the wheels are near together, such a truck will be continually wobbling on the track, the wheels becoming transverse to the line of motion, and the flanges will thus produce great unnecessary friction against the rails. If the freedom of the trucks to swivel is properly controlled by the use of side bearings, this friction is, to a great degree, prevented. The last truck in a train has the greatest freedom of motion, for reason of the fact that no car is attached to it in the rear. This freedom of motion makes it the unsteadiest truck in the whole train, allows it to wobble most, and produces the greatest friction. I have noticed this effect at high speeds. I therefore answer this question in the negative.

11 X. *Ans. to 11th Cross.* My reading of books, my observation of railroads in England in 1831, and my intercourse with engineers, enable me to compare the present state of railroad engineering with what existed prior to 1834—the date of Winans's patent.

12 X. *Ans. to 12th Cross.* Steadiness of motion is a most desirable quality in every railroad car, whether on four or eight wheels, but great length in the car body is not essential to the attainment of great steadiness of motion at high velocities. Long cars have never been made to go more steadily than the short English cars now used. Other things being equal steadiness of motion is not the consequence of length in the body of the car, but results from various other causes, of which it is sufficient to name: the increase of weight; the position of the centre of gravity; the mode of traction and of coupling; and the use of springs, swing bolsters, side bearings, and a variety of other instrumentalities; while the mere increase of length alone would have but a limited effect.

13 X. *Ans. to 13th Cross.* Certainly; cars that are to be worked in

long trains should be so made as to be capable of being used in any part of the train.

14 X. *Ans. to 14th Cross.* As I have already explained, it is neither important nor essential that all the trucks in a train should have the same freedom of motion; the only question is whether each truck has such freedom to swivel as will enable the rail to guide its motions without unnecessary strain upon the flanges; the fact that the hind truck of the train has too much freedom of motion, shows that the others should not have the same degree of freedom. If the draft was by the trucks, although this would increase the friction on the king-bolt, yet that increased friction would bear no comparison in amount to that occasioned by the side bearings in preventing the free swiveling of the trucks when the draft is by the body.

15 X. *Ans. to 15th Cross.* It is not essential, in order to give enough freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them; on the contrary, practical experience of many years' duration, on the railroads of Massachusetts, as well as those further South, has shown the contrary to be the fact, and such mode of draft is in use at the present day, and is approved of as having peculiar advantages. The common mode of draft is by the king-bolt, although the mode of drawing by the truck is still in use on the Providence road, and was used for many years on the Boston and Maine Railroad; and a new invention has been made and used for drawing by the trucks, as the most improved mode of traction; but there is a diversity of opinion and practice as to the best mode of draft under all circumstances.

16 X. *Ans. to 16th Cross.* Model "B" represents a larger bearing surface between the two bolsters, than is required by the specification, and less, according to my judgment, than is shown in the drawing.

17 X. *Ans. to 17th Cross.* Model "B" shows no mode of attaching the draft.

18 X. *Ans. to 18th Cross.* A peculiar mode of constructing the trucks without any other framing than connecting the axles by long springs, is described by the Complainant, in his specification, as an essential part of his invention.

19 X. *Ans. to 19th Cross.* I do think springs or their equivalents are as essential to the proper constructing of an eight-wheel car as of a four-wheel car. The use of them must depend upon the use to which the cars are to be put; passenger cars should be made as easy as possible.

20 X. *Ans. to 20th Cross.* The description and drawings of the Chapman carriage do represent substantially a railroad car like model "K," except in the particulars before noted, and which are not material. I have already shown the manner in which draft was applied to it, and the language which describes and represents it will be found on pp. 129 and 30 and 139, including the plate.

21 X. *Ans. to 21st Cross.* There is no representation or description of a draw-link, such is attached to the model marked "A," in Tredgold's description or drawing of an eight-wheel car, but the mode of traction is shown on all the other cars united in trains in Tredgold's book.

22 X. *Ans. to 22d Cross.* Tredgold does describe and show provisions for enabling the truck-frames to swivel laterally and conform

to the curves of the road. I refer to the drawing, plate 4—description, page 179.

23 X. *Ans. to 23d Cross.* I have already, in speaking in regard to the Allen steam carriage, pointed out the general resemblance between the Allen steam carriage and the carriage described by Winans. I refer to the language in the specification in which Winans describes the trucks, the arrangement of the wheels, and the connection of them with the body; but I have shown in what respects these differ, and that the Allen does not embrace what may be called the elastic spring-truck, the bearing of all the weight upon the centre alone, nor the extreme proximity of the flanges. There is, therefore, no language in the patent which describes these peculiarities of Winans, which will be an exact description of the corresponding parts in Allen's; for the rigid wheel-frame of Allen's is very unlike the elastic truck without a wheel-frame of Winans. The side bearings of Allen's are not described by Winans; and placing the flanges nearly a foot apart, as Allen does, is not described by the very close proximity required by Winans's description.

24 X. *Ans. to 24th Cross.* I have already stated, in regard to the Quincy car, what elements are there embodied, and have stated that it did not include some of the peculiarities of construction demanded in said Winans's patent; and in those respects in which the Quincy car differs from Winans, it agrees with the cars used by the Eastern Railroad. And I ought to have made the same remark in relation to the Allen carriage.

25 X. *Ans. to 25th Cross.* A mechanic, in 1829 or '30, having ordinary skill in his business, and having become acquainted with what was then known, as to the construction of cars, would have known what were the requirements and characteristics of railroad cars, to enable them to move safely and smoothly over the curves and inequalities of railroads, at the rate of thirty miles per hour, and perform the ordinary duties of the ordinary cars now in use. There was nothing requiring invention to be added to what was then well known. His sources of information and knowledge would be the experience derived from a long use of the train roads in England, and of the passenger roads then in use; and the same qualities which would enable them to move safely and smoothly fifteen miles per hour, which speed had then been attained, would enable them to run safely and rapidly at thirty miles per hour, although it might be requisite to increase the strength of the parts or to make some slight changes in the proportion of parts. Increasing the rate of speed develops no requirements which are different in kind from those required at lower rates of speed. The difference is in degree, and not in kind—as in 1831 I myself rode in England, on railway trains, at the rate of thirty-miles per hour. I have no reason to doubt that speed was attained in 1830. The requirements in mode of construction of four-wheel cars in England, which go sixty miles per hour, are identical with those which first went fifteen miles per hour.

26 X. *Ans. to 26th Cross.* I do consider the arrangement of railroad car wheels firmly fixed to their axles and rotating with them, as the same in principle and well known mechanical equivalents for those rotating on fixed axles.

27 X. *Ans. to 27th Cross.* The Quincy car, I have always been informed, drew by the truck.

28 X. *Ans. to 28th Cross.* Each mode of draft has its peculiar advantages, as I have before said. I do not consider it a matter of indifference which mode is used. What would be best in one case might not be best in all others. I judge that drawing by the truck and thereby giving a direction to the wheels has great advantages over other modes of traction, *when such draft doth not interfere with other conditions.*

29 X. *Ans. to 29th Cross.* The cars described in the works of Wood, Tredgold and Strickland, referred to, were four-wheel cars, and wheels attached to the body. No mode of draft is shown on the Tredgold eight-wheel car.

30 X. *Ans. to 30th Cross.* The Chapman carriage exhibits a mode of applying the draft to the body and not to the trucks.

31 X. *Ans. to 31st Cross.* The drawings and descriptions of the Chapman engine, and all other invention or treatises of which I have any knowledge, either before or since 1830, including my own experience, have no tendency to teach me that placing the wheels of the trucks very near together, as compared with the distance at which they had been placed apart by Allen, Tredgold, Chapman and Quincy car, would reduce the friction between the flanges and rails in passing curves.

32 X. *Ans. to 32d Cross.* Neither would all my means of knowledge and experience teach me that steadiness of motion at high velocities would be attained by constructing the car body of great length and supporting it at or near each end upon two trucks so constructed. My experience has taught me to the contrary; and the drawings and descriptions inquired of would not have taught a mechanic, in 1830, so erroneous a principle of construction.

33 X. *Ans. to 33d Cross.* Neither would the above-mentioned drawings have taught a mechanic, in the year 1830, nor would all the knowledge acquired since that time teach any one, that in order to move over the curves and inequalities of a railroad at a high velocity, in safety and stability of motion and least practicable friction on the rail, that the truck should have the greatest possible freedom to conform to the surface of the rails, and should not be constrained by the draft.

34 X. *Ans. to 34th Cross.* In the said drawings and descriptions there are descriptions of railroad cars, both of four and eight wheels, completely adapted to run at high velocities, such as have been practised since 1830; and no further modification of them has been found necessary for that purpose, so far as relates to the principles and operation of the running gear.

35 X. *Ans. to 35th Cross.* The purpose shown and explained in the drawings and descriptions inquired of, for which eight wheels in one car or carriage were employed, were in no instance *solely* for the purpose of carrying great weights. The eight wheels were placed in two swiveling trucks, for the same purpose which they are intended to answer in Winans's car; that is, to conform to the curvatures and inequalities of the road, to carry the load safely and evenly, and to avoid unnecessary friction of the flanges on the rails. Each of these prior inventions is expressly adapted to each of these purposes. The lan-



guage of the Chapman patent and of Tredgold's treatise, the construction of their cars, the Allen carriage and the Quincy car, are as plainly indicative of these objects as the car described by Winans.

36 X. *Ans. to 36th Cross.* I have no personal knowledge in regard to the use actually made of eight-wheel cars prior to 1830.

37 X. *Ans. to 37th Cross.* I have not been employed by any person, or persons, or corporation, to assist in the preparation of this case, or to procure evidence to impeach the validity of Winans's patent. I am connected in the case in no way but as a witness, nor am I interested in the result of the suit.

38 X. *Ans. to 38th Cross.* I am employed as civil engineer by the Eastern, and Boston and Lowell Railroads; both these roads use eight-wheel cars.

39 X. *Ans. to 39th Cross.* I have not formed an opinion that the letters patent of Ross Winans are invalid for want of novelty or originality; for, so far as I know, the peculiar use of long springs to unite the axles of the wheels in the manner described by him, had not been before used.

40 X. *Ans. to 40th Cross.* I have not stated that I am a railroad superintendent.

41 X. *Ans. to 41st Cross.* I have not seen or had stated the substance of the foregoing interrogatories, or any of them.

And in answer to additional direct interrogatories on the part of the Defendant:

[Further interrogatories, page 659.]

1 *Add. Ans. to 1st Add. Direct.* I know of nothing, of my own knowledge.

2 *Add. Ans. to 2d Add. Direct.* No, sir.

3 *Add. Ans. to 3d Add. Direct.* No, sir.

4 *Add. Ans. to 4th Add. Direct.* No, sir.

5 *Add. Ans. to 5th Add. Direct.* No, sir.

6 *Add. Ans. to 6th Add. Direct.* No, sir.

7 *Add. Ans. to 7th Add. Direct.* No, sir.

8 *Add. Ans. to 8th Add. Direct.* There is an essential and material difference between them. The wheels in the eight-wheel cars, as used, have not the close position insisted upon in Winans's patent. The eight-wheel cars, as used, have rigid truck-frames, which support the wheels in their proper position, independent from the springs, which are used only for their proper object. The weight is not borne upon the centre-bearing, as insisted upon by Winans, but upon the side-bearings—an arrangement inconsistent with his theory. I have no hesitation in saying that the mechanical theory in Winans's patent is essentially different from the mechanical theory applied in the construction of the eight-wheel cars on the Eastern Railroad.

9 *Add. Ans. to 9th Add. Direct.* It is not.

10 *Add. Ans. to 10th Add. Direct.* I have already answered this question.

And in answer to additional cross-interrogatories on the part of the Plaintiff:

[Further cross-interrogatories, page 660.]

1st X Add. Ans. to 1st Add. Cross. The theory of Winans, which I have referred to, as I understand it, requires that the wheels of the trucks should be placed *as close together as possible without touching; that the whole load should be borne upon the centre bearing*, and connected with the truck by a centre pin or bolt, so as to allow them to turn upon each other, in the manner of the front bolster of a "common road wagon;" *also the use of long springs connecting the wheels, instead of the common arrangement of truck-frames.*

2d X Add. Ans. to 2d Add. Cross. I know of no means of ascertaining the average rate of speed, accurately, prior to 1830. They were principally used for freight, prior to that time.

3d X Add. Ans. to 3d Add. Cross. Prior to 1830, and since that time, railways have been constructed in such manner and with such material, that distribution of weight rather than concentration was and is required.

4th X Add. Ans. to 4th Add. Cross. I cannot now state distinctly from recollection prior to 1830. The Manchester and Liverpool road was opened for all traffic Sept. 16, 1830. The Darlington Road was in operation, I think, prior to that time.

5th X Add. Ans. to 5th Add. Cross. The use of railways prior to 1830 was principally for the transportation of minerals. The first successful application of steam in the present form was, I think, in October of the year 1829. Horses were commonly used up to that time.

6th X Add. Ans. to 6th Add. Cross. I have before stated that I could not state the average speed prior to 1830, when horse power alone was used. I should think that six miles per hour might be the full average speed.

7th X Add. Ans. to 7th Add. Cross. I have designed the trucks for railroad cars, and for that purpose investigated the principles connected with such construction. They were built within the three years last past. The trucks are connected with steam machinery of locomotives, two of which have been constructed—one now upon the Boston and Worcester Road, the other upon the Fitchburg Road.

WM. P. PARROTT.

## DEPOSITION OF HENRY W. FARLEY.

I, Henry W. Farley, of East Boston, in the District of Massachusetts, aged thirty-four years, by profession an engineer, on oath depose and say, in answer to interrogatories proposed to me in behalf of the Respondent, in the case of *Ross Winans v. The Eastern Railroad Company*:

[Interrogatories, page 649.]

1. Ans. to 1st Direct Int. My name is Henry W. Farley; my age is thirty-four years; my place of business is at East Boston; my profession is that of an engineer.

2. Ans. to 2d Direct Int. I was originally a millwright; and since that time I have been constantly engaged in the construction and repairs of machinery, especially that of railroads. I have been over ten

years last past in the employ of the Eastern Railroad Company, and five or six years superintendent of motive power—having charge of all the mechanical work of the road, including cars. I am perfectly familiar with their construction and mode of operation. I have been accustomed to take and to read all the leading works on railroad machinery, and I have endeavored practically and theoretically to gain all the knowledge I could upon this class of subjects.

3. *Ans. to 3d Direct Int.* I am familiar with the eight-wheel car in general use and with its mechanical principles of construction and action; and, so far as I know, those on the Eastern Railroad are the same as those in general use.

4. *Ans. to 4th Direct Int.* I have examined Ross Winans's said specification, and understand the same.

5. *Ans. to 5th Direct Int.* The model "B," now shown to me, is a true representation of the car described and recommended in said Winans's patent.

6. *Ans. to 6th Direct Int.* The essential characteristics of construction and arrangement of the eight-wheel car are: Two trucks under one body; the body to be of sufficient length to allow the trucks to swivel without collision against each other. The trucks should be placed far enough apart advantageously to support the body upon the trucks, it being generally found in practice expedient to place the bolster about seven or eight feet from the end of the platform framing of the car body. The trucks themselves should have four wheels each, held in rigid wheel-frames, that are well braced to keep them square. The wheels in each truck should be distant apart, from centre to centre, or between the bearing points, about the same as the gauge or distance between the rails of the track, and form a square on the track, from one bearing point to the other. The middle or centre of each truck must have a king-bolt connection with the body, and the body must have side bearings on the truck-frame, to steady itself and prevent side rocking when in motion. The distance between the bearing points of the wheels on the rails is the essential and elemental feature. The distance between the flanges is not essential or material, but results from the diameter of the wheels and the distance between the bearing points on the rails. It is the action of the bearing points of the wheels upon the track, and the reaction of the track upon those bearing points, which govern and control the motion of the car upon the rails.

7. *Ans. to 7th Direct Int.* They have a different construction and arrangement, and numerous improvements or inventions, not described in Mr. Winans's specification.

They have rigid square-sided wheel-frames, pendulum or swinging bolsters; they have male and female transom-plates for the trucks to swivel upon; have pedestals and springs to allow the axles to move vertically, and still keep them parallel with each other, and the wheels square on the track. Some of the cars have India rubber springs; have patent lubricating boxes; have patent soft metal bearings; have safety beams in the truck-frame, to hold it up if an axle breaks; have improved brakes; have changing backs to the seats; have ventilators; have draw-spring couplings; have patent car-wheels.

In relation to the difference between the construction and arrangement of the cars used by the Eastern Railroad and those described in

the patent of Winans, I think that it is essential in principle and important in results. The more important of these differences are these:

1st. Winans bears all the weight of cars upon the centre of the bolster. The Eastern Railroad bears no weight on the centre; it is all upon the outside bearings.

2d. Winans bears all the weight on the top of the bolster; the Eastern Railroad suspends all the weight on swinging bolsters.

3d. Winans draws the cars either from the truck or the end of the body; the Eastern Railroad draws by the king-bolt.

4th. Winans puts the wheels very close together, with a mistaken idea or theory of avoiding freedom by so doing; the Eastern Railroad place the wheels about two feet apart, between the flanges; or the axles about as far apart as the width of the track, for the purpose—1st, of avoiding friction, then to make the truck run steadily on the track, and carry the body steadily, and prevent the truck wobbling about on the track; also, to save unnecessary wrenching of the rails; also, to distribute the weight of the body over as large a surface of rails as possible, and thus give a larger base for the support of the truck.

5th. The application of spring pedestals, so that the wheels and axles are allowed a vertical motion, independent of the truck-frame, while the body has a lateral motion, by means of the swinging bolster, also independent of the motion of the wheels.

Some persons used, in old times, to make the wheels of trucks nearer together than they do now, because it was cheaper to build a short than a long truck. And one great reason why trucks have not been built still longer than they have been is, the economy of building; and another reason is, that the position of the trucks under the body of the car must be near the *end*, because you cannot support the part of the car projecting over the trucks, while the body *between* the trucks can well be supported by trusses. So that the length of the truck, and the distance of the wheels apart is thus limited, because it will not do to let the frame project beyond the end of the *body*, nor interfere with the stairs or steps on which the passengers mount into the cars. If it had not been for this we should have built passenger trucks of the Eastern Railroad much longer, and spread our wheels much farther apart than we have. Models "E. R. R." Nos. 1 and 2, are the kind of truck and eight-wheel cars which I mean to describe, and I refer to them as a part of my answer. They are correct models of those in use on the Eastern Railroad. [The above models, E. R. R., No. 1, No. 2, and marked B. F. Hallett, Commissioner, are those referred to in the above answer. B. F. HALLETT, Com.]

8. *Ans. to 8th Direct.* The bodies of the eight-wheel cars now in use are constructed and attached to the trucks, so that by removing the king-bolts, the body can be lifted up and removed from the trucks, or the trucks taken away from the body. The bolsters are generally placed about seven feet from the end of the platform, or bottom framing of the body, and about four feet from the end of the box part of the body.

9. *Ans. to 9th Direct.* The eight-wheel cars used by the Eastern Railroad, always have side-bearings, either friction rollers or smooth slides, to keep the body steady when in motion, and *prevent* side rocking.



10. *Ans. to 10th Direct.* Check chains or safety chains are used to prevent the trucks from slipping from under the body, and from turning around sideways, in case it runs off the track.

11. *Ans. to 11th Direct.* Increasing the length and strength of the body, and leaving the trucks to occupy their position under the ends of the body, involves no invention. The principle is the same as in a smaller or shorter car. It is not invention to make a long car on the same principle as a short one; and a long car thus made would operate precisely upon the same principle as the short car.

12. *Ans. to 12th Direct.* Constructing a truck connecting the axes of the wheels by a steel spring, as described in said patent, instead of using a rigid rectangular wheel-frame, would be wholly unsafe, and in a passenger car and [?] unfit for practical use, for the following reasons:

The axes could not be kept parallel in actual use, by reason of the uneven distribution of the stress upon the respective sides of the truck, consequent upon unequal burdens being placed over them in the car, or unequal action on the inequalities of the road from time to time, both unevenness of the track and the greater stress suffered by the outer front wheel in passing the curves. The elasticity of the springs thus allowing the wheels continually to approach and recede from each other, tends to throw the truck at all times off the track. The nearer the wheels approach each other the greater the danger.

Connecting the axes of the wheels by leaf springs renders the springs peculiarly liable to twist, and thus the truck does not stand square upon the track; even a slight variation from the squareness of the truck is in many cases fatal. It is rare that springs, though equal when made, continue in use to retain equal elasticity. If a spring should break, the car would be likely to be dashed in pieces. Such structures are not safe. Therefore the construction and arrangement of the truck, as recommended in said specification, combining the twofold disadvantage of a close proximity of the wheels and a liability to spread at times and to twist upon the track, renders it wholly unsafe, and unfit for practical use. Brakes could not safely be applied to such trucks; and there are other reasons why I think it very unsafe.

13. *Ans. to 13th Direct Int.* This drawing represents a freight car, and not a passenger car, which is the only one described in Mr. Wiggins's specification. The drawing represents a rigid rectangular wheel-frame for the trucks. In the specification, instead of a rigid wheel-frame, the axles of the wheels were connected only by a steel spring, bolted to the boxes of the axles, with a bolster bolted across to the tops of the springs. The drawing represents two springs on each side of the truck-frame, the action and reaction of which may not tend to throw the axes of the wheels out of parallelism. The specification particularly recommends one spring only on each side of the truck, to connect the axes of the wheels, and the action of that spring would necessarily throw the axes out of parallelism. The drawing represents the springs with the shorter leaves downwards. The specification directs exactly the reverse.

In the drawing, the bolsters on which the body rests, are placed between five and six feet from the ends of the platform of the car; whereas the specification requires the same to be placed at or near or beyond the ends of the body, and, in any event, no farther under the body than

that the wheels shall come just within the ends, and the trucks are to be coupled as remotely from each other as can conveniently be done for the support of one body. In the drawing, the wheels are placed sufficiently far apart to put a brake in between them; while in the specification the wheels are directed to be as close as possible, without the flanges touching, to have them act as near as may be like a single wheel.

The drawing represents a conical pivot, marked "X," with sockets and side bearings, forming a solid bolster in one solid piece, with a lower bolster and pocket "Y" to correspond; while the specification describes a plain bolster of wood or iron, reaching across from spring to spring, united to an upper bolster by a king-bolt, swiveling in the manner of the front bolster of a common road waggon.

The drawing shows a mode of coupling or drawing the car by two pieces bolted across the bottom framing, and a coupling bolt with a ring in it to drop through the coupling, to draw the car from the middle of the end of the body; the specification neither describes nor intimates any mode whatever by which the cars are to be drawn. The drawing shows cast iron pockets for the ends of the springs to work in; the specification prescribes a different mode of fastening the ends of the springs, viz.: bolting the ends of them on to the boxes of the axles. The drawing shows an arrangement of brakes suited to the swiveling trucks of the eight-wheel car; the specification does not describe nor mention any mode of arranging or using brakes.

14. *Ans. to 14th Direct Int.* I have examined the specification of William and E. W. Chapman, published in the 24th volume of the Repertory of Arts, in London, in 1814.

15. *Ans. to 15th Direct Int.* I have examined the model marked "K." It is a true representation of the eight-wheel engine, described in the Chapman specification, published in the Repertory of Arts, in 1814. It also can be changed as directed by the specification to make the six-wheel engine.

16. *Ans. to 16th Direct Int.* A car builder of ordinary skill, would, in my opinion, be able to construct the eight-wheel cars now in use, in all their essential principles, from Chapmans' specification and drawings. The car described by the Chapmans has the rigid square wheel-frames, with side bearings and king-bolts, to support the body and allow the trucks to swivel to the curves and irregularities of the road. The bearing points of the wheels are equal in distance apart on the rails; the same as the gauge of the track; and the axles are held parallel, and the wheels square on the track; two of these trucks support one body to form the eight-wheel car. The running gear should be placed at or near the ends of the body, which is always the position of all swiveling running gear, of all sorts of carriages, and well known to coach and car builders.

17. *Ans. to 17th Direct Int.* Yes, it has them all.

18. *Ans. to 18th Direct Int.* I have measured the distances. The distance between the bearing points of the wheels is equal to the gauge of the track.

19. *Ans. to 19th Direct Int.* The model is changeable from one to the other, and represents both the six and eight-wheel car described by Chapmans' specification.

20. *Ans. to 20th Direct.* I have examined that book published by Thomas Tredgold in 1825, in London, and do find there a description and drawing of an eight-wheel double-truck car.

21. *Ans. to 21st Direct.* The component parts of the car shown in said treatise and drawing, consist of a car body double the usual length of the four-wheel cars, two four-wheel trucks, each truck having four wheels united by a rigid rectangular wheel-frame, and the middle or centre of said truck being united to the body by means of a swiveling bearing, which will allow the truck freely to swivel and easily to pass all the curves and inequalities of a railroad; the points at which said swivelly [?] bearings support the body are so far distant from each other as to allow the trucks not to interfere with each other, while they are at the same time protected from collision in trains by the ends of the body projecting beyond them. The distance of the bearing points of the wheels from each other will be about equal to the gauge or width of the track they are intended to run upon, assuming the track to be of the ordinary width, and the wheels to be of the ordinary diameter. The drawings and description plainly show that the truck is to swivel horizontally. Cars thus constructed are calculated to adapt themselves to all the curves, straight track, and inequalities of railroads, and to pursue a steady and safe course on the track, far superior to the ordinary four-wheel car.

22. *Ans. to 22d Direct.* I have examined the said model, marked "A," and it does correctly represent the eight-wheel car described and shown in the drawing of said Tredgold's Treatise. "A" is the one described by Tredgold, and will perform as his description requires. The draft of the Tredgold car is from the end of the body, that mode being distinctly shown in said treatise.

23. *Ans. to 23d Direct.* The running gear of the Tredgold car and also the cars in general use, and on the Eastern Railroad, have alike rigid wheel-frames, connected by centre pivots to the body near its ends, and swivel to the curves. The bearing points of the wheels are about equal in distance apart, and they both contain the same essential principle in the construction and arrangement of the running gear with the body. They are substantially identical.

24. *Ans. to 24th Direct.* The Tredgold car, as it is described, is expressly calculated and adapted to answer the same purposes as is claimed to be accomplished in the said Winans's specification. I have also examined the models marked "C" and "D," and they are not correct representations of the said eight-wheel cars, as described. They are not, because the one marked "C" has no vertical pivot or axis for the frames to turn on, but has a cross axletree running through the side piece, which destroys its strength, and will not allow it to conform to the curves and other inequalities of the road, and will not allow it to perform the function of an eight-wheel railroad car, as required by Tredgold, as it would not turn between the rails when the wheels encountered inequalities, and would not turn to suit the change of level on a curve of double curvature, as indicated by Tredgold's description. The wheel-frame spoken of by Tredgold is the same kind as before described by Chapman; that is, a regular wheel-frame, having the usual middle cross-piece and king-bolt; the cross-piece is secured by a joint bolt, as shown in the drawing of Tredgold. The pillow block on



model "D" would be the usual mode of supporting the bearing of a cross axletree, if such were intended to be described; but that is not shown nor intended in Tredgold's drawing and description.

25. *Ans. to 25th Direct.* I have examined a certified [?] of the said patent and drawings. I find in the said drawings clearly shown the peculiarities claimed in said Winans's patent, excepting that the axles of the wheels are borne by a rigid rectangular wheel-frame, and not connected together by yielding springs. The close proximity of the flanges of the wheels in each truck is there shown, the flanges being represented as but a very few inches apart. The trucks are constructed in two ways; one allows the axes of the wheels a certain limited motion in the truck-frame itself, with a view of allowing it to conform to sharp curves, as represented in figures 1 and 2; while the other truck in figure 2 is constructed in the ordinary manner, allowing no play to the axes; each of these trucks swivel under the body by means of large transom plates, and are placed near the ends of the body of the car. Fairlamb's drawings embraces all of Winans's arrangement. One of the trucks in figure 2 allows the axles to play; and the other truck is the rigid wheel-frame, holding the axes parallel, as is the case in cars in general use. So far, therefore, as regards the near coupling of the wheels in each truck, and the remoteness of the trucks from each other, it is identically the same as Mr. Winans's.

26. *Ans. to 26th Direct.* A mechanic of ordinary skill in car building, having had Fairlamb's drawing before him, and adopting the truck in figure 2, which holds the axes parallel, or in other words omitting the apparatus which permits the axes to vibrate, and constructing both trucks alike with parallel axles, would have nothing to do but copy the drawings in order to construct an eight-wheel car, such as is in common use, excepting that the wheels in each truck would be closer together than those in general use, thereby more resembling the arrangement claimed by said Winans.

27. *Ans. to 27th Direct.* I have examined the model and drawings of the Allen steam carriage. The said steam carriage is borne by two trucks; each truck has four wheels, in a rigid rectangular wheel-frame, which preserves the parallelism of the axes. The points at which the wheels bear upon the rails are about equal to the width or gauge of the track, which distance is the most beneficial in actual service. The truck-frame is united to the axes of the wheels, by means of springs and pedestals, similar to those now in general use, which, while it gives ease of motion to the burden carried, effectual [?] prevented the axes from at any time losing their parallelism, by confining the motion allowed by these springs at all times to planes perpendicular to the track, and equidistant from each other. Thus the wheels were always kept square on the track. The fore and hind wheels of the truck were of different diameters, but this fact is wholly immaterial. Each truck had a bolster running across the centre of the same, from side to side, and this bolster was connected with an upper bolster, on which the steam-carriage rested, by means of a large swiveling pivot or king-bolt operating also as a transom-plate, and the trucks swiveling readily and freely to the curves and other inequalities of the road. There were also anti-friction side bearings upon each truck, to keep the body of the steam carriage from rocking, and assist in supporting the same. The



two trucks were placed so near the ends of the steam-carriage, that the ends of the truck-frame projected beyond the body; and this position was best calculated to sustain the weight of the body; a part of the body hung down between the two trucks. The body of the steam-carriage was long, so that it readily rested on two four-wheel trucks, allowing them to swivel to the curves without interfering with each other; and the distance of the bearing bolster was nearer to the ends of the body, than the position now usually adopted in passenger cars, from the end of the body platform. The said steam apparatus may be taken off, leaving the bolsters and all other parts as they were, and a platform or body for passengers substituted without invention. And this carriage will then, as it did before, combine all the mechanical elements of the eight-wheel railroad passenger car, as ordinarily used, embodied in a manner exceedingly well adapted to pass smoothly, steadily, and safely over the straight track as well as the curves and irregularities of railroads; and indeed contains all the most essential features of the running gear now in general use, and is far better calculated to attain the objects described in said Winans's specification, than the mode of arrangement which is recommended in the patent itself. The whole of the objects or beneficial results set out in said Winans's patent, and much more, are embodied in said Allen's steam carriage.

28. *Ans. to 28th Direct.* I have examined the said model. It consists of a long bearing platform, which is made of solid timbers fastened together by two cross pieces at the ends thereof, which, while they unite these long timbers, at the same time constitute the bolster pieces. These bolster pieces are penetrated by king-bolts, which pass through these and through the middle of the ends of the centre timber; the under part of each bolster is rounded up, and it is also armed with a transom plate and side bearings, which correspond to similar transom plate and side bearings upon the trucks underneath. There are two trucks, one at each end of the bearing platform, swiveling under it upon the king-bolts. Each truck has four wheels, and a solid, rigid, rectangular wheel-frame covered by a solid platform, and said wheel-frames have side pieces and double cross-bolsters. The axletrees on which the wheels revolve are metal, and bedded in the cross timber at each end of the wheel-frame. The bearing points of the wheels on either side of the truck are about the same distance from each other as the width or gauge of the track. The diameter of the wheels is smaller than those in general use at the present time. The trucks are coupled sufficiently remote from each other to allow each to swivel entirely around without interfering one with the other. In regard to its mode of operation, it is precisely the same in principle as the eight-wheel cars now in common use; the bearing points of the wheels being equidistant with the gauge of the track, and the two trucks placed at or near the ends of the bearing platform, adapts this car to an equal distribution of the weight to be carried upon the rails, while the swiveling of the truck adapts it to pass smoothly and safely over the straight parts, curves, and often inequalities of the road, and the peculiar shape of the bolster adapts it to conform to great and sudden changes of grade, and the side bearings to prevent the body from swaying or tipping one way or the other.

29. *Ans. to 29th Direct.* The said Quincy car does not contain the

peculiar mode of uniting the axles of the wheels by a spring bolted to the boxes, and owing to the small size of the wheels the flanges are not brought as near as possible without coming in contact; but all that is material and essential in the arrangement of the eight wheels of the car, and the connection thereof with the body, is there reduced to practice, in a manner which obtains all the advantages while it avoids the defects of the arrangement as shown in said Winans's specification. The trucks are placed as far apart as the length of the body will permit, and the wheels are brought so near together that their bearing points are as far apart as the width of the track; and this arrangement, on the whole, is better than a closer proximity of the wheels. The Eastern Railroad use wheels of different sizes, some of them not exceeding twenty inches in diameter.

30. *Ans. to 30th Direct.* Four-wheel railroad cars having been before constructed and in use, and the Quincy car showing the manner in which two trucks could be placed under the ends of a car body, and there being nothing to prevent the builder from making the body as long as the amount of travel or transportation required, or increasing the diameter of the wheels, the constructor would be called on to do nothing else, but merely change proportions and to substitute wheels, turning with axles, which were well known equivalents for wheels turning on axletrees. It is true that various improvements have been applied to modern cars in addition to what is in the Quincy car; but the arrangement of the wheels, and construction and connection of the truck with the body of the car, still remain the same in its essential character. And no invention would be requisite, so far as regards the arrangement of the wheels and the connection of the trucks with the body of the cars, to swivel to the curves and run safely and smoothly on the road.

31. *Ans. to 31st Direct.* I have seen the aforesaid works; said mode of coupling was familiar and publicly used and shown.

32. *Ans. to 32d Direct.* I have examined the said works; the bearing points appear to be about equal to the gauge or width of the track; the same as now used by the best constructed cars.

33. *Ans. to 33d Direct.* Such springs and pedestals were described and shown in the manner inquired of.

34. *Ans. to 34th Direct.* The wheels and axles revolving together, and also the wheels revolving on fixed axles, were both well known equivalents before the year 1830, and are described in 'Tredgold, Wood and Strickland's Treatises.

35. *Ans. to 35th Direct.* None of the foregoing changes involve anything else than an alteration of the proportions, or substitution of well known equivalents for each other. It would, therefore, require no invention whatever to make these changes.

36. *Ans. to 36th Direct.* The distance between the flanges, of itself, is not material, and it may be varied by increasing or diminishing the diameter of the wheels without changing the mechanical principles or mode of operation of the car.

37. *Ans. to 37th Direct.* The distance between the bearing points of the wheels in each truck on the rails is material, because it is through the bearing points that the rails direct or guide the car in its motion over the road.

38. *Ans. to 38th Direct.* Maintaining the axles of the wheels in each truck at a fixed and uniform distance from each other, is material, because it is necessary to hold the axles to keep the wheels square and steady, and the truck upon the track.

39. *Ans. to 39th Direct.* Nothing in particular that now occurs to me.

40. *Ans. to 40th Direct.* I consider that the theory of Winans in relation to those parts of his invention in which he undertakes to depart from the principles or proportions of those cars which preceded his patent, is very erroneous, as will appear from the opinions I have already given on the different questions I have answered. And the facts on which my opinions are founded are principally from experience; and this shows conclusively that the nearness of the wheels on each truck, the bearing of the weight of the body on the centre, and the elastic spring truck, make a car wholly useless and untrustworthy for rapid travelling.

And in answer to cross-interrogatories proposed on the part of the Plaintiff:

[Cross-interrogatories, page 654.]

1 X. *Ans. to 1st Cross.* My previous business was that of a millwright, at which I worked two or three years; it was my business then to construct and arrange machinery. It has been so since, especially in connection with railroads.

2 X. *Ans. to 2d Cross.* I have been practically conversant with the running gear of railroad cars. This has been part of my business many years. I had charge of repairs of cars for four or five years before I became superintendent of motive power on the Eastern Railroad.

3 X. *Ans. to 3d Cross.* I have not.

4 X. *Ans. to 4th Cross.* Such has been my common habit for many years, to a great extent.

5 X. *Ans. to 5th Cross.* It has.

6 X. *Ans. to 6th Cross.* I answer this question in the affirmative.

7 X. *Ans. to 7th Cross.* In my opinion all unnecessary friction should be avoided on all parts of any machine. All machinery must have more or less friction. Each machine is a compromise between the advantages and disadvantages peculiar to itself; and in regard to friction, it is the rule to avoid it, unless you sacrifice some other point which is of more advantage than the friction is disadvantage.

8 X. *Ans. to 8th Cross.* The friction between the flanges of the wheels and the rails, will in one sense be proportionate to the resistance which the wheels offer to the guidance of the rails. In another sense it will not be proportionate. The answer depends upon what is meant by *guidance of the rails*.

9 X. *Ans. to 9th Cross.* The wheels of a four-wheel car or the truck of an eight-wheel car, will not run upon a curve with less friction between the flanges and rails by the axles of the wheels being very near each other. I have built a truck with the axles eight feet apart. I observed their running for at least three or four months; it is still in use on the Eastern Railroad. This truck runs on the road and round the curves with less friction between the flanges and the rails than any other truck



on the road. This is the opinion not only of myself, but of others connected with the road that have occasion to move it round. So well is the superintendent satisfied in this point, that it has been decided to have all the new passenger car trucks built in this way. We use four-wheel cars continually on our railroad for freight, and occasionally for passengers. The axles of these cars are six feet apart, and it has been well ascertained that it requires less power to carry the same load on these four-wheel freight-cars than on the double-truck eight-wheel cars, which have their wheels near together. And it is the result of much experience and observation, and confirmed by the opinions of others who have seen and observed the operation, that there is far less friction between the flanges and rails, in the trucks or cars that have their wheels from six to eight feet apart, than on any less distance. Some of the best locomotive builders in this country are now placing the wheels of their trucks near five feet apart. On the Eastern Railroad no difference is made in the distance of the wheels apart, in the freight and passenger cars. I have already given other reasons for my opinions in former answers.

10 X. *Ans. to 10th Cross.* No, sir. When the trucks have too great freedom of motion they are too readily turned from one side to the other; they keep bobbing about instead of travelling smoothly; the flanges are continually brought in contact with the rails; and the want of steadiness and directness in the forward motion of the truck is caused by its being too easily swiveled, or having too great facility of motion between the rails causes far greater friction than would occur if there were less freedom of motion. I cannot doubt from theory, of the truck when in motion, and from actual observation, that it is necessary to control the entire freedom of the truck by friction between the truck and the car, if you would avoid unnecessary friction against the rail, and carry the car in the most direct manner.

11 X. *Ans. to 11th Cross.* I am; my means of knowledge is from books, the knowledge I have acquired of my business, and many years practical experience of the subject.

12 X. *Ans. to 12th Cross.* Every improvement in the steadiness of the motion of cars is a gain, and it is still desirable to advance further in that direction. According to my judgment and observation the steadiness of motion at high velocities, is not the result of great length in the body of the car. It depends on weight, the position of the centre of gravity, the springs, mode of draft, the couplings, and various other particulars. A light car, however long, would be unsteady in its motion at high velocities. Any one would observe the difference in the steadiness of motion of a car with a full load with one nearly empty; or one in the middle of the train and one in the rear, which is coupled only at one end. In order to make the four-wheel cars as steady as the eight-wheel car, it is necessary to place the axles at a proper distance from each other. This was not properly attended to in the first four-wheel cars made in this country. In England I understand it has been attended to, and the four-wheel passenger cars have been in use there from the commencement of railroads to the present time. And it is well known that the four-wheel cars in that country run as steadily as the eight-wheel cars in the United States, and the bodies are far shorter than ours.



13 X. *Ans. to 13th Cross.* When cars are intended for trains, they should have couplings at both ends, that will enable them to be placed in any part of the train.

14 X. *Ans. to 14th Cross.* I learn that the mode of draft through the truck has been used on many of our roads, and is still in use on some of them. The first truck in such a train has to draw all the other cars; but such has never, I believe, in practice, been found to interfere, in any appreciable degree, with the freedom of the trucks. The hinder truck in all trains has too much freedom of motion for ease of car or for the good of the wheels or rails.

15 X. *Ans. to 15th Cross.* In my last answer I have already said that I do not consider it necessary that the draft should not be applied to or act through the trucks, in order to give them sufficient freedom of motion.

16 X. *Ans. to 16th Cross.* Model "B," as I should judge, has no more bearing surface between the bolsters than is required in the specification, and less than is shown in the drawings.

17 X. *Ans. to 17th Cross.* Model "B" explains no mode of draft whatever.

18 X. *Ans. to 18th Cross.* The direction of the patent is to have the trucks composed of four wheels and two axles, connected together by springs, the springs connected by a bolster; this mode of building a truck differs from other well-known modes. I consider it an essential part of Mr. Winans's patent, as described and claimed.

19 X. *Ans. to 19th Cross.* I do consider it essential to use springs on passenger car trucks.

20 X. *Ans. to 20th Cross.* I think it proper to call the carriage represented in Chapmans' patent, "car." It cannot, with any propriety, be called a locomotive or an engine; no engine is drawn, shown or described; the patent is merely to show cars to which an engine or locomotive power may be applied, and the means of applying to a four, six, or eight-wheel car. Even if the motive power had been applied within the body, or upon the platform of the car, if there were still room for carrying passenger [?] or freight, I should call it a car or carriage, as we call the cars now in use which carry the passengers at one end and the engine in the other. The draft was applied to the platform, in a line between the middle of the two ends, the rope or chain pulled the car along by the motion of the windlass or drum, and the effect was the same as though the car had been united to a locomotive by a rope fastened in the middle of the end of the platform.

21 X. *Ans. to 21st Cross.* The drawing in Tredgold, which is a mere sketch, does not show the mode of draft; that appears from other drawings in the book on four-wheel cars.

22 X. *Ans. to 22d Cross.* The drawings on the plate IV, the description of it on page 179, show clearly that the trucks in the eight-wheel car were made to conform to the inequalities and curvatures of the road.

23 X. *Ans. to 23d Cross.* I have described Allen's locomotive in my direct answer, and have compared it with Winans's. I do not see that I can be more explicit.

24 X. *Ans. to 24th Cross.* I have stated what I consider to be the construction and principle of the Quincy car, and compared them with

Winans's. I cannot give any clearer idea of where they agree or differ than I have already done.

25 X. *Ans. to 25th Cross.* From knowing what was already familiar to car builders in 1830, one could not help knowing the things mentioned in this question.

26 X. *Ans. to 26th Cross.* I do.

27 X. *Ans. to 27th Cross.* I have been informed that the Quincy car was drawn by the trucks; sometimes they were allowed to move by gravity.

28 X. *Ans. to 28th Cross.* No, sir. Drawing by the king-bolt is generally the best way. This is the way in which all the cars on the Eastern Railroad are drawn, except the four-wheel car; they are drawn by the end. The king-bolts of ordinary passenger cars are generally about seven feet from the end of the foot board; if the draft were from the middle of the end of the platform, in passing reverse curves it would cause great strain upon the foot-board, and great friction between the wheels and rails, and have a direct tendency to throw the car from the track.

29 X. *Ans. to 29th Cross.* Yes, sir. But I do not consider it necessary to repeat all the details of this description on such a mere sketch as Tredgold's eight-wheel car, and, therefore, I said that the model was correct.

30 X. *Ans. to 30th Cross.* The Chapman car is the only instance to the contrary, I now recollect.

31 X. *Ans. to 31st Cross.* Neither my knowledge of books, or of any of the inventions mentioned in this question, nor my own experience and observation down to the present hour, would make me believe that placing the wheels of trucks very near together would reduce the friction between the flanges and rails, over curves and straight track. I am satisfied that the fact is directly the other way.

32 X. *Ans. to 32d Cross.* To secure steadiness of motion the body should be supported, as it always has been, near the end, but great length of body is not necessary to steadiness of motion, as I have already said.

33 X. *Ans. to 33d Cross.* I have already said that, in order to enable trucks to pass curves and curvatures of a railroad, at high speed, with steadiness of motion, and with the least friction, it is necessary that the trucks should not have the greatest freedom to conform to curvatures of the rails, and I have stated why not.

34 X. *Ans. to 34th Cross.* Before 1830 the four-wheel and the eight-wheel cars were so organized as to enable them to be run at any velocity which is now attainable. Nothing was necessary but sufficient strength of the parts.

35 X. *Ans. to 35th Cross.* The objects of the Chapman car and of the Tredgold car were not only to carry great weights, and divide and equalize the stress on eight wheels, but so to arrange the wheels in trucks, and so to connect the trucks with the body, as to enable them to pass the curves and inequalities of the roads, and to enable the builder of the cars to make the distance between the points of support of the two ends of a car as great as desirable, and thus to admit any desirable length of body. This was accomplished by the invention of the swiveling trucks, and placing two of them as supports under or near the two

ends of the body ; these cars, thus constructed, were adapted to answer the same purposes designed to be arrived at in the Winans car.

36 X. *Ans. to 36th Cross.* Of my own personal knowledge I cannot answer this question.

37 X. *Ans. to 37th Cross.* I answer all parts of the question in the negative.

38 X. *Ans. to 38th Cross.* I am Superintendent of Motive Power on the Eastern Railroad. This Company use a great number of eight-wheeled cars.

39 X. *Ans. to 39th Cross.* I am not aware of having entertained the opinion that the patent is void. There are two peculiarities in which the improvement described in the patent differs from any car-truck I ever saw used. One is the bearing of all the weight of the car on the centre of the bolster ; the other is the elastic spring to connect the two axles. Whether the patent is good for these improvements, I do not know.

40 X. *Ans. to 40th Cross.* I do not belong to any association of railroad superintendents, and know nothing of any committee, such as is inquired of.

41 X. *Ans. to 41st Cross.* I have not seen, heard, or had stated to me, the foregoing interrogatories.

And in answer to further interrogatories on the part of the Respondent :

[Further Interrogatories, page 652.]

1 Ad. *Ans. to 1st Ad. Direct.* I have been for the last ten years in and about the shop of the *Eastern Railroad*, in my ordinary business. I have never known of Ross Winans, or any one on his account, making any objection to the Company's building or using such cars as they have used. Nor have I ever known that any claim was made against them for so doing, until the present suit was begun.

2 Ad. *Ans. to 2d Direct Ad.* It would not.

3 Ad. *Ans. to 3d Ad. Direct.* It would not.

4 Ad. *Ans. to 4th Ad. Direct.* There is not.

5 Ad. *Ans. to 5th Ad. Direct.* There is not.

6 Ad. *Ans. to 6th Ad. Direct.* There is not.

7 Ad. *Ans. to 7th Ad. Direct.* I reply in the negative.

8 Ad. *Ans. to 8th Ad. Direct.* There is a clear difference between the theories which Winans's improvement developes and that on which the cars in common use are constructed and connected with the body ; these differences are essential.

9 Ad. *Ans. to 9th Ad. Direct.* Mr. Winans says, in his specification, that the advantages of his improvement may be obtained by sustaining the body at or near the end ; and therefore increasing or diminishing the length of the car will make no material difference.

10 Ad. *Ans. to 10th Ad. Direct.* I have already expressed my opinion on this subject, and stated my reasons.

[Further cross-interrogatories, page 660.]

And in answer to further cross-interrogatories on the part of the Plaintiff :

1 *X. Ad. Ans. to 1st Ad. Cross.* The theory I mean, that which requires the wheels to be placed very close together in each truck. The constructing the truck without a frame, and coupling the axles with springs, and bearing all the weight of the load on the centre of the bolster without side bearings.

2 *X. Ad. Ans. to 2d. Ad. Cross.* Before 1830 the roads were used for transporting freight; the freight trains go slower than passenger trains.

3 *X. Ad. Ans. to 3d Ad. Cross.* All roads are constructed so as to require the weight of cars and locomotives to be distributed to the best advantage. Concentrating the weight is and always was ruinous. This is one of the objections to the too close approach of the wheels to each other. They should never be so near as to rest more than one at a time upon a single span of rails.

4 *X. Ad. Ans. to 4th Ad. Cross.* I have learned that there were two railroads in England on which passengers were carried. One the Stockton and Darlington, the other the Liverpool and Manchester.

5 *X. Ad. Ans. to 5th Ad. Cross.* I learn that horses were used, likewise stationary and locomotive engines.

6 *X. Ad. Ans. to 6th Ad. Cross.* The rate of speed must have varied so much, I do not see how I could give an opinion.

7 *X. Ad. Ans. to 7th Ad. Cross.* I have designed a variety of different kinds of running gear for railroad cars, within the past ten years, for the Eastern Railroad.

HENRY W. FARLEY.

## DEPOSITION OF ROBERT H. EDDY.

I, Robert H. Eddy, of Boston, in the District of Massachusetts, civil engineer and solicitor of patents, on oath depose and say, in answer to interrogatories proposed to me on the part of the Respondent, in the suit of Ross Winans *v.* the Eastern Railroad Company:

[Interrogatories, on page 649.]

1. *Ans. to 1st Int.* Robert H. Eddy is my name; I reside in the city of Boston; my profession is that of a civil engineer and solicitor of patents, in which business I have been engaged upwards of twenty years.

2. *Ans. to 2d Int.* The constant practice of my profession has made me more or less practically and theoretically acquainted with machinery in general; and many of the improvements in railway cars which have been made, have been brought to my especial notice at various times.

3. *Ans. to 3d Int.* I believe that I am familiar with the general mechanical principles of the construction and operation of double-truck eight-wheel railroad cars, such as are used by the Eastern Railroad Company, and various other railroads in the United States.

4. *Ans. to 4th Int.* I have examined an authenticated copy of the specification and one of the drawings, which was filed in the patent office after the date of the patent.

5. *Ans. to 5th Int.* I have examined the model marked B. In my opinion it truly represents a car described and recommended in the



specification of said Winans. [The Commissioner has affixed his signature and card to said model B.] B. F. HALLETT, Com.

6. *Ans. to 6th Int.* In the first place, I should say that each of the sets of four wheels should be sustained in an unyielding truck or frame, which should be braced, or otherwise made very strong, and so as to permit the axles of the wheels in respect to it to play only in vertical directions. Second, that each of the truck-frames should be so applied to the car body as to be capable of swiveling horizontally through a short arc, or one sufficient to enable the set of wheels to turn any curve of the railroad. Third, that the two trucks should be arranged underneath the body, so as not only not to come into contact with each other, but not to project beyond the adjacent ends of the car body or the platforms thereof, so as to come in contact with extraneous objects. The axes of the two axles of the wheels of each truck should be placed at a proper distance apart, to prevent the truck wheels from injurious wobbling, and to enable them to act with sufficient leverage to guide the truck-frame, such distance being in practice about equal to the gauge of the track. Side-bearings, or suitable contrivances, should be applied to the truck-frames and car body, in order to prevent injurious lateral rocking of the car body. To counteract the effect of lateral jar (on passengers or freight on or in the car body) arising from the shock of the flanges or guides of the wheels against the rails of the track, the central bearing of the truck-frame should rest on a swinging platform, or the equivalent therefor; also, that the car body, if intended to run in trains, should be provided with suitable springs to relieve the car from the sudden shocks of starting and stopping the car or train. The draft apparatus, or connection of one car with another, should be such as will admit one car to play or move laterally and vertically, with a proper amount of independence of the other, so that it may conform to the curves and irregularities, or changes in the level of the track. The journals of the wheel axles should be sustained in boxes made to play vertically, and be supported by springs sustained by the truck-frame. The above are the general principles to be observed in the construction of eight-wheel cars for passengers, and, although some may be dispensed with in the construction of freight cars, yet the adoption of them would render such freight-cars *more advantageous* than they would otherwise be.

7. *Ans. to 7th Int.* They have several additions, not specified or alluded to in the specification of Ross Winans's patent; such, for instance, as safety beams in the truck frames—a mechanism for so connecting the brakes of both trucks as to enable a person at either end of the car to put in action all the brakes of both trucks, thus connecting the two trucks together by the brake mechanism; also draw springs, a brake apparatus, and a swinging mechanism for upholding the bearings of each truck-frame. The bodies of the cars are made very much longer, or about double the length of that of the eight-wheel passenger or other car described in Winans's specification, wherein it is stated that he makes the body of each car about double the ordinary length of those which run on four wheels, such cars in 1834, or thereabouts, being about twelve feet in length. The pedestals or boxes of the wheels are arranged in guides, which allow them

only to play vertically, in order that the axles may play in vertical planes and be kept square to the track, or so as to prevent them from getting out of parallelism in vertical planes, &c.

8. *Ans. to 8th Int.* By removing the king-bolts on which the truck frames swivel, the bodies of the cars can be removed from the running gear or truck-frames. The bolsters of the trucks are generally placed at about seven or eight feet back from the end of the platform of the body.

9. *Ans. to 9th Int.* Side bearings on the cars are, I believe, universally employed, they being placed between each of the truck-frames and the car body, and transversely of the car, and respectively at or near the two opposite sides of the truck-frame; their objects being, first, to prevent lateral rocking of the car body while the car is in operation on the track; second, to resist effects of centrifugal force; third, to interpose such friction upon the truck as will prevent it wobbling uselessly; fourth, to cause the wheels of the truck to cling to the track.

10. *Ans. to 10th Int.* I have also seen safety chains on some of the cars—they operating to limit the extent of swiveling of the truck-frame, and to prevent it from turning around too far in case of accident or otherwise.

11. *Ans. to 11th Int.* It is simply a change of proportion, or a mere matter of construction, and not of invention. It introduces no new mechanical principles in the general organization of the car, nor in the action or relative relation of the parts to each other; nor no new principle in the operation of the car or the running gear.

12. *Ans. to 12th Int.* I should say that when their boxes were connected by long springs, as described in such specification, such a connection would be disadvantageous in practice, and would render a car unsafe. I think it a plan that no skillful workman would adopt; for should one of the springs break, the probability is the body of the car would fall upon the wheels, and the whole truck-frame be destroyed or materially injured, and great injury result to the car body. Besides this, the operation or great pressure of the brakes on the wheels would tend to cripple or break the springs. The metal, by repeated vibrations, has the cohesion of its particles diminished, and is thus constantly rendered more liable to break. The truck is liable to twist, and thus get off the track. The axles will be liable to get out of parallelism horizontally, in consequence of the elasticity of the springs. The arrangement of the wheel boxes and the springs together, produces a leverage, which increases the liability of the brakes when put in action to rupture or break the springs at or near the boxes. These long springs, uncontrolled by side bearings, would render the car liable to a surging or violent undulatory motion. I conceive the truck of Winans to combine so many disadvantages, that it must be quite unsafe in practice.

13. *Ans. to 13th Int.*—to which copy of drawing from patent office is annexed by Commissioner. *Ans.* This drawing, which, from its title, purports to exhibit Ross Winans's improvement in the construction of cars or carriages intended to run on a railroad, and to be a true delineation of the invention described in his patent, of the 1st of October, 1834, does not, in my opinion, indicate a car constructed with running gear on the principle or manner *particularly* described and *recommended*

in such specification; for, in the first place, the wheels are not shown as connected by a spring with its ends bolted or otherwise secured to the upper sides of the boxes, which rest on the journals of the axles. In the drawings each of the wheels is shown as supported against the middle of a single spring, whose ends play in pockets connected with the truck-frame. The upper bolster "H," of figure "3," is formed with side bearings, which are not described in the specification. It is also formed with a pivot "X," while the lower bolster is made with a corresponding socket, whereas the specification describes the bolsters as connected by a *centre pin* or *bolt* passing down through them, and thus allowing them to swivel or turn upon each other in the manner of the front bolster of a common road wagon. The drawing exhibits a brake apparatus and a draft shackling pin, neither of which are mentioned or described in the specification. The position of the bearing carriage of each end of the car is further from the end of the platform or body of the car than the limits mentioned in the specification. The method of constructing the truck, as described in the specification, would render it difficult, if not impossible, to apply brakes to the trucks and wheels. In a close examination of the drawing and specification, and comparing them together, particularly in respect to those points which are embraced in the claim of the patent, I find that the two disagree in the following particulars:

1st. In the construction of the truck, as above stated. 2d. In the mode of connecting together the axles of the two sets of wheels of each truck. 3d. In the mode of connecting the upper and under bolsters, which the specification requires to be, by the whole weight being made to rest on the centre, while the *drawing exhibits side-bearings, extended to some distance from the centre.* 4th. The distance of the wheels apart, in the specification, differs from that denoted by the drawings; for, in the former they are to be as near as may be, without contact of the flanges, while in the latter *they are represented so far apart as to admit of a set of brakes being placed between the wheels.* 5th. The specification requires that each set of four wheels should be arranged, either *at or near each end* of the body of the car, or so far within the end of the body as to bring all the wheels *under* it, or so far without the body of the car as to allow the body to hang between the two sets of wheels. In the drawing the distance from the end of the body to the nearest wheel is shown as about *three feet.*

14. *Ans. to 14th Int.* I have seen and examined the same.

15. *Ans. to 15th Int.* I have examined the model marked "K," and am of opinion that it substantially represents a railroad carriage, described and illustrated in the said volume 24, of the said Repertory of Arts, &c. [The model "K" is marked B. F. Hallett, Com. and his card attached.]

16. *Ans. to 16th Int.* I have no question but that any carriage builder of ordinary skill, on reading the specification, and examining the drawings of the said invention of the Messrs. Chapman, would be able, without the exercise of any of his inventive powers, to construct an eight-wheel car, consisting of a platform, supported on two truck-frames, each resting on four wheels, and connected to the frame by a pivot or its equivalent, such as would permit such truck, independently of the other, to arrange itself on its wheels, to the curve of the railway; and that,



besides this, he would apply, between the truck and the platform, side-bearings or curved rails and conical wheels, which, practically speaking, are equivalents for the side-bearings used on the eight-wheel cars of the Eastern Railroad. Besides all this, he would make the distance between the axes of the fore and hind axles of each truck a little less than, or about equal to, the gauge of the track or distance between its rails, such being the case in the cars of the Eastern Railroad. I consider the mode of arranging the wheels of each truck for the support of the load, and the method of connecting such wheels with the body of the carriage, that is to say, by an unyielding frame, such as will enable the flanges of the wheels to guide the wheels in the curves, *and force the frames to turn on their pivots*, to be substantially like that practised in the eight-wheel cars of the Eastern Railroad; in other words, I consider the naked combination of a long car body, and two such unyielding truck-frames, each resting on four wheels, arranged under said body, and within its ends, and so connected to the body by a pivot or centre-bolt as to enable it to swivel or turn laterally, so as to adapt itself to the changes of direction of the track, and independently of either the body or the other truck, to be the principle of invention of the eight-wheel car, having swiveling truck-frames; such being the car used on the Eastern Railroad; and I consider such a car to be described in the said specification of the Messrs. Chapman.

17. *Ans. to 17th Int.* Such is the fact.

18. *Ans. to 18th Int.* Such I find to be true, as I have herein before stated, essentially.

19. *Ans. to 19th Int.* The model or parts marked "K," are susceptible of such changes, or can be converted into a six-wheel or eight-wheel carriage, at pleasure.

20. *Ans. to 20th Int.* I have seen and examined the said Treatise on Railroads and Carriages, by Thomas Tredgold, and particularly the American edition thereof, published in New York, in 1825, and I have found therein the description and a drawing of a double-truck eight-wheel car for railroads.

21. *Ans. to 21st Int.* The said car is composed of a body resting on two wheel-frames, each supported by four wheels. Each wheel-frame is connected to the body by an axis on which the frame turns, when from any inequality the axes of the wheels are not *in the same plane*. The body is to be sustained so that its pressure may be divided equally among the wheels, and for this purpose it is supported on each wheel-frame, *in the middle of its length*, and is to be connected with them so as to allow the greatest possible *change of level on the rails*, in which case the pressure on each wheel is always rendered as nearly equal as possible. In order that each wheel may be made to bear an equal pressure or strain, as far as practicable, when from any inequality the axes of the wheels are not in the same plane, I think it is very clear that the axis that connects the wheel-frame to the body, must be a vertical one, and it must be so applied as not only to allow the frame to swivel or turn horizontally, but to work up and down, or rock in vertical directions, so as to enable the frame to conform either to the changes of level and also curves of the track, as in ordinary cases, wherein there is a king-bolt connection of the truck and body. The drawing represents the fore wheels of one wheel-frame, and the hind



wheels of the other, as placed far enough apart to prevent any collision between them. So in regard to the two side wheels of each of the wheel-frames; they are placed at a distance apart a little greater than one-third the distance between the centres of said wheels. Each wheel-frame is exhibited as placed centrally between the middle and end of the body, each end of the body being shown as projecting beyond the wheel immediately under it.

22. *Ans. to 22d Int.* I have examined both models, "A" and "C," and think "A" is a correct representation of the Tredgold car, while "C" is not a correct representation of the same; and for the reason that its platform or body is supported on the truck-frames by horizontal axles. Such will not permit its wheels to conform to certain curves and irregularities of the track, while the car of Tredgold *will* permit its wheels to conform to such curves and irregularities; its truck-frames being connected to the body by centre-bolts or axes, on which the frames turn, when from any inequality the axes of the wheels are not in the same plane. In going from the straight part to the curve of a track, the outer rail gradually rises. This, while one truck is on the straight part, and the other on the curved part of the track, will throw the axles of the *two* trucks out of the same plane. Any sudden depression of one of the rails will generally throw the axles of the two trucks out of the same plane.

The model marked "C" will only conform to changes of level in line of the track, or changes of grade; while the model marked "A" will not only conform to such changes of level, but to those which are transversely of the track.

[The models A and C are marked B. F. Hallett, Com., and his cards attached.]

23. *Ans. to 23d Int.* I perceive no essential difference in the main principle of their construction and operation, except in the use of side bearings.

24. *Ans. to 24th Int.* So far as Winans, by near and distant coupling of the axles of the eight-wheels, had the object of making the car pursue a more smooth, even, safe and direct course, when running on the track, than could cars as ordinarily constructed, with short bodies and four wheels, the Tredgold car possesses all the advantages of that of Winans.

25. *Ans. to 25th Int.* I have. I find there a double-truck, long-bodied car, which embodies all that is essential and elemental in the eight-wheel car, as described in the said Winans's specification. It also embraces a supposed improvement in allowing the axles of the wheels to change their position in the truck, and it does not embrace the uniting the axles by means of springs and boxes. I mean by all that is essential and elemental, a body and *two* trucks swiveling under it, and each having four wheels, the body being long enough to allow the trucks to freely swivel.

26. *Ans. to 26th Int.* To all branches of this question I reply in the affirmative.

27. *Ans. to 27th Int.* [The Commissioner's card is attached to this model, with his seal.]

*Ans.* I have examined the model of the said Allen steam carriage, but I have not seen the drawings of it. It is constructed with a long

body resting upon two swiveling trucks, each of which is sustained on four wheels whose two axles are placed at a distance asunder equal to or about equal to the distance between the treads of the two wheels of each axle. There are roller side bearings between the trucks and body, and one spring to each wheel, and the axles are provided with pedestals, that allow of vertical motion to them. The trucks are placed so as not to interfere with each other while swiveling, and so far under the body at its ends, as to be protected from collision with those of an adjacent car, when the car is in a train. Two of the wheels in each truck are of greater diameter than the others, being evidently used for drivers; but such use of them is immaterial to the principle of the operation of the running gear, if the connection between the drivers and the engine were effected by a ball joint and connecting rod, or any apparatus which would not interfere with the proper swiveling of the trucks. I consider the practical benefits of the eight-wheel cars in general use as being attained in this carriage, and that the construction and arrangement of the running gear of it is substantially the same as those of the said ordinary eight-wheel cars.

The Allen steam carriage does contain a construction and organization calculated to obtain all the beneficial results as claimed to be accomplished in the said Winans's specification. All that is essential or elemental in the Winans's car, is embodied in the Allen steam carriage; but the Allen steam carriage contains three features not found in Winans's car, viz. the rigid truck-frame, the side bearings, and the spring pedestals. There are two features of the said Winans's carriage which it does not contain. These are the resting the weight of the body wholly on the centre of the bolsters, and connecting the axles solely by long springs and boxes. In these five particulars the Allen carriage is superior to that of Winans's.

28. *Ans. to 28th Int.* [The Commissioner's card and seal are attached to this model.]

*Ans.* It consists of a timber platform, whose ends are formed as bolsters, to rest on two reversed bolsters, forming parts of the bearing carriages, that are arranged under the ends of the main platform, and are connected to it by vertical king-bolts, so as to allow them to swivel horizontally and conform to the curves and irregularities of a railway track. There are also side bearings and four-wheels to each truck or wheel-frame, the said wheel-frame being made as a rigid unyielding structure.

The axes of the wheels are placed at about the same distance apart as are the external side edges of the flanges of either two wheels of either of the axles. The bearing carriages turn freely, without interference from one another. The adaptation of the carriage bodies to the platform, by means of bolsters and king-bolts, insures the easy conformity of the carriage to the curves, inclined planes, and inequalities of the track, and enables it to run smoothly and safely thereon, as do the cars of the Eastern Railroad, which I consider in principle identical with the Quincy car.

29. *Ans. to 29th Int.* The method of uniting the boxes of the wheel axles, viz., by strong springs, extending from the boxes of the hind to those of the fore wheels of each truck, and uniting such springs by a bolster, is not in the Quincy car. Nor are the hind and fore wheels of

each truck of the Quincy car placed so near as may be, without injurious contact of their flanges, although the bearing points are about as near as in common eight-wheeled cars. The weight of the load is not supported wholly on the centre, but on side bearings also. In other respects I do not perceive any practical or essential difference between the car described by Winans, and the said Quincy car.

30. *Ans. to 30th Int.* I have no doubt that he would. He would only have to change the proportions of some of the parts—the wheels, for instance; such being a matter of talent, or skill, and not of invention. One person, being a better constructor or better skilled in his art than another, may make a car body longer than the other would, knowing by the mechanical principles every workman of common skill is expected to have, that such would present certain well understood advantages. In the same way he might make it broader, or vary its proportions in other respects, or apply the operative parts by methods or mechanism well known for easing motion or preventing injury from shocks or percussion. In all this he would only be applying the ordinary knowledge of his business, and not exercising any powers of invention.

31. *Ans. to 31st Int.* I have seen and examined the Wood's and Tredgold's Treatises on Railroads, published in 1825, also Strickland's Reports on Canals, Railways, etc., published in 1826, and find in each of such works that the mode of drawing railroad cars by a coupling from the middle of the ends of the bodies, is fully represented. I have, therefore, no doubt that, previously to the year 1830, such a mode of draft was well-known and shown and described in various printed works.

32. *Ans. to 32d Int.* In the work of Strickland, on page No. 5, we find the wheels represented as three feet in diameter, and placed at fourteen inches apart. The distance between the axes of their axles is about equal to the gauge of the track. In Tredgold's work the gauge of the track is mentioned as four feet six inches, wheels two feet eleven inches in diameter, and placed about twelve inches apart. In this country the car wheels are not far from three feet in diameter. The gauge of the track is four feet eight and nine-tenths inches, or about four feet and nine inches, and the wheels are usually arranged with their axles at about four feet eight inches, from centre to centre. These measures vary more or less; but, as a general rule, I believe, the distance between the axes of the axles should be equal to the gauge of the track or distance between the rails.

33. *Ans. to 33d Int.* Springs and pedestals, as now used on the eight-wheel double-truck cars, are exhibited in the American edition of Wood's Treatise (1832), and also in the said Allen model.

34. *Ans. to 34th Int.* In Wood's Treatise on Railways, and in Tredgold's work, both published in 1825, we find mentioned the modes of causing wheels of railroad cars to revolve *with* the axles and *on* the axles. Both of these devices were, therefore, well known before 1830. (See pages 77, 78, and 80, of Wood's Treatise; also pages 104 and 106 of that of Tredgold.) One might easily be used as an equivalent for the other, in supporting a carriage on its wheels.

35. *Ans. to 35th Int.* The mechanical principles and mode of operation of the said car would remain the same, whether the axles were



fixed and the wheels made to revolve on them, or the wheels fixed to the axle and both made to revolve together. The said principles would not be changed by changing the diameters of the wheels, nor by drawing the car by the body instead of the truck, nor by increasing the length of the body of the platform. An increase or diminution of the length of the body of the platform would make no change in the effect produced by the combination or principle. Nor would the principle of the invention be changed by placing a box on the top of the platform, whether to contain passengers or merchandize, nor by making the car run at a greater or less speed. Any and all such changes might be made without any exercise of invention, but simply by the application of talents, skill, and knowledge of workmen usually employed for such purposes.

36. *Ans. to 36th Int.* In the construction and operation of a railroad car, the distance of the flanges of the two adjacent wheels on one side of the truck is a matter dependent on the diameter of the wheels and the distance of their *axes* apart. While the diameter remains the same we may increase or diminish the distance of the flanges apart by correspondingly increasing or diminishing the distance of the axes apart. So under any given distance of the axes apart from each other, one may vary the distance of the flanges or guides of the wheels by increasing or diminishing the diameters of the wheels. Increasing the diameters will decrease the distance of the flanges, while decreasing the diameters will increase such distance. Any change in such respects is a mere change in proportion of the parts, and can effect no change in the combination or principles of invention of the railroad car, made with two swiveling trucks, each resting on four wheels. The changes in proportions involve no new effect.

37. *Ans. to 37th Int.* I consider the distance between the bearing points of the fore and hind wheels of each truck, which is the same as the distance between the axes of the two axles of the said wheels, as material or essential, in a considerable degree, to the operation of the cars. For instance, should we place the axes of the wheels a distance apart equal to the gauge of the track, there would be less wobbling of the truck and friction of the flanges on the rails, and less tendency of it to run off the track than there would be were such distance diminished. All this would be apparent to a good and skillful carriage builder. As, however, we should meet with difficulties were we to so far increase the distance of the axes apart, as to cause the trucks to come in contact while swiveling under the body, we should endeavor to find some convenient distance for the axes which, while it reduced the difficulties resulting from placing the axes near together, would not encounter this difficulty resulting from extending them too far apart.

38. *Ans. to 38th Int.* The maintaining the axles of the wheels in vertical parallel planes, or at a fixed and uniform distance apart, while the carriage is in motion on the track, I deem to be very essential to safety and smooth running, because unless the boxes of the axles were confined in rigid guides that only permit them to play vertically, there would be a tendency of one axle to so twist or move out of parallelism with the other, as not only to injuriously effect the guiding properties of the wheels, but to increase the danger of their running off the track. Besides this, the axles of the wheels must be sustained so as to be ca-



pable of resisting the great pressure of the brakes on the wheels during the operation of arresting the motion of a car while running on a railway.

39. *Ans. to 39th Int.* There is nothing that I now think of.

40. *Ans. to 40th Int.* I think each theory on which Mr. Winans's plan is founded, is erroneous. *First*, the theory of bearing all the load on the centre of the bolster, for the purpose of relieving shocks and concussions, is incorrect; because the absence of side bearings allows the dangerous tendency of the body in motion to sway to and fro laterally on the straight track, and in passing curves to be thrown over the outer rail by centrifugal force, and to give uncontrolled action to the springs connected with the wheels, whereby they are not estopped by side bearings from rising from the track. *Second*, the theory of connecting the axles by springs, as being safe and economical, and conducing to the steady motion of the body, is erroneous, as I have before stated the reasons why. Such a mode of connection would be unsafe and of no practical utility, and as incompatible with the application of brakes, and for the reasons before suggested. *Third*, the theory that by a close proximity of the wheels in each truck, by bringing the flanges of the wheels as near together as may be without touching; in other words, bringing the axes of the wheels as nearly as possible to coincide with the radii of the curve on which they may be passing; in other words, making the two wheels on each side of the truck resemble in their action, as nearly as possible, that of a single wheel;—all these theories, thus expressed, whatever may be said of them in the abstract, I consider to be entirely erroneous in actual practice, as applied to the trucks of a railway car.

The nearer the wheels in each truck are brought together, all other things being the same, the more the truck will wobble, the more unsteady and unsafe the motion, the greater the friction of the flanges against the rails. The more the action of the two wheels resembles that of one, the greater will be the danger of their turning round on the track. The greater also is the danger from the fact that any inequality on the rail will cause both wheels to be thrown up in too rapid succession, so that the first thrown up cannot recover itself or return to the rail before the second is thrown up.

It must be remembered that the treads and flanges of the wheels present curved surfaces to the rails, and that whatever may be the position of their trucks the rail is essentially tangential to such curves—I mean to say it is tangential to the circular curve of the tread of the wheel. It is also tangential to the curve of horizontal section of the flange, taken on a level with the top of the rail or below it. Hence it will be perceived, that whatever may be the position of the truck on the rails, there is, practically speaking, but one point in each flange which can come in contact with the inner edge of the rail, on which the wheel rests. The object of curving transversely the side of the flange, is to produce a long horizontal curve of it, in the plane of the rail, for the purpose of not only preventing unnecessary rubbing of the flange against the rail, but of enabling the flange to conform readily to the curve of the rail. This curve of the flange is also to prevent the flange from catching on obstructions or the jittings of the ends of rails by one another. The distance of the bearing points apart is what affords

the leverage necessary to swivel the trucks and keep them on their course. It is obvious that when the flanges are made with curved flares, as shown in the annexed drawing, that it is not possible that bringing the wheels in each truck very close together, can have any effect whatever in diminishing the friction in passing curves. The drawing I hereto annex, marked "R. H. Eddy," [marked also B. F. Hallett, Com.] exhibits a correct representation of vertical and horizontal sections of the rail and wheel flanges, taken under my direction, from a car and rail of the Eastern Railroad. It also exhibits a side view of a portion of a car used on the said railroad. The vertical section of the tread and flange is that which is adopted in the formation of the wheels used on the Eastern Railroad, and the dimensions as well as other matters represented on the plan are correctly given.

And in answer to cross-interrogatories by Complainant:

[Cross-Interrogatories, page 654.]

1 *X. Ans. to 1st Cross.* Nearly the whole of my professional life has been spent in the examination, analysis and comparison of machinery.

2 *X. Ans. to 2d Cross.* I have been particularly conversant with the construction and operation of the running gear of railway carriages, by reason of having personally examined the same, and kept myself acquainted with the history of the progress of improvements in this branch of machinery, having been frequently called professionally to turn my attention in that direction.

3 *X. Ans. to 3d Cross.* I have been examined as an expert in courts of justice in patent causes. I have been thus examined many times, and on a great variety of machinery, and upon such classes of subjects as mechanical and engineering experts are usually examined.

4 *X. Ans. to 4th Cross.* I have been accustomed to a great extent and for many years to the examination and comparison of machinery, with a view to forming and expressing, and acting or directing others to act upon my opinions as to the substantial identity or want of identity between different machines and combinations of apparatus. This has been, to a very great extent, my professional business.

5 *X. Ans. to 5th Cross.* Although in former years my professional duties led my attention to the surveys and locations of railroads, and various other works of internal improvement, it has been no part of my professional duty or employment to superintend in person the construction and arrangement of running gear of railroad cars.

6 *X. Ans. to 6th Cross.* I am theoretically and practically acquainted with railroad engineering, so as to understand the principles involved in the construction and operation of railroad cars of various kinds, and the properties essential to their proper operation, under the present condition of railroad construction and engineering; and I have such a knowledge of the subject as will enable me to compare the different constructions of cars, and to judge therefrom whether they are practically adapted to answer the purposes required of railroad cars, under the conditions of high rates of speed, steadiness of movement, and the curvature and irregularities of the road commonly found in the working of railroads in this country.

7 X. *Ans. to 7th Cross.* In my judgment unnecessary friction in any machinery should be avoided ; and in a railroad car friction between the wheel flanges and the rails should be avoided, as far as possible, having due regard to the other considerations which should regulate the construction of the parts of the structure.

8 X. *Ans. to 8th Cross.* There are two conditions in the running of trucks, in which it may be said that the rails are guiding the wheels : the one is that in which the rails cause the truck to change its direction ; the other is that in which no such change is required, as in the ordinary running of the truck on the straight track, and on a regular curve, after the truck has once taken a direction conformable thereto. There is also other friction caused between the treads of the wheels and the rails, the same being developed more particularly in the passing a curve, and is due to the unequal length of the two rails of said curve, when the wheels are both united to the same axle. The cause of the greatest amount of friction is not due to the guiding property of the rails in *changing* the *direction* of a truck, but is due to their action in maintaining the position of the truck ; and it is therefore according to which of these senses the words, " guidance of the rails " are used, that I should say that the friction inquired of would or would not be proportionate to the resistance.

9 X. *Ans. to 9th Cross.* I do not consider that the wheels of a four-wheel car, nor of the the [?] truck of an eight-wheeled car, will run upon a curve between the flanges and rails, the nearer the axles of the wheels are to each other, either for the reasons set forth in Winans's specification, or for any other reason. It is well settled, by practical experience, that this is not the fact ; and the same conclusion may clearly be deduced from a scientific examination of the theory of that structure. By a curve I mean such curves as are used on the railroads in this country.

10 X. *Ans. to 10th Cross.* When trucks have the greatest freedom of motion of which they are capable, while in actual operation in eight-wheeled cars, and where they yield most readily to the guidance of the rails, in causing them to change their direction from one side to the other, or, in other words, where they are most easily swiveled to and fro, they encounter, in running over the curves and irregularities of the road, far more friction between the flanges and the rails, than when their freedom of swiveling is to a certain limited extent controlled and regulated by the means now usually employed for that purpose. The reason of this increase of the friction is because the flanges are more frequently brought into contact with the rails, in consequence of the wobbling of the truck, resulting from its too great facility of movement. The trucks now in use on the eight-wheel cars of the Eastern Railroad and other railroads of this country, have applied to them a mechanism connecting their brakes, and operating in such a way as to enable a person at either windlass, at the ends of the car, to put in operation, at any one time, all the brakes of the two trucks. For this purpose there are several kinds of such mechanism, they being known as " Tanner's patent brake apparatus," " Hodges's patent brake apparatus," " Stevens's patent brake apparatus." Each of these, by means of levers and iron bars, or the mechanical equivalents therefor, forms a connection between the two trucks, and also between the trucks and the body



of the car, whereby they exercise an important control over the swiveling movements of the two trucks on the rails. In the act of applying the brakes, in order to arrest the motion of the car, this brake apparatus undoubtedly exercises a very important control over the motions of the trucks, modifying, to a greater or less extent, according to circumstances, the freedom of swiveling.

11 X. *Ans. to 11th Cross.* I am, from reading and my professional education, sufficiently acquainted with the state of railroad engineering, at and before the date of Winans's patent, to make a comparison of the present state of railroad engineering with what then existed.

12 X. *Ans. to 12th Cross.* Steadiness of motion is a desirable characteristic of all descriptions of railroad cars. No degree of steadiness has ever yet been obtained, which renders further advancement undesirable or unnecessary. In my opinion, making car-bodies of great lengths, as compared with the modes practised before Winans's patent, is not essential to the attainment of steadiness of motion at high velocities. There are various elements which must be incorporated in a railroad car, whether on four or eight wheels, in order to secure suitable steadiness of motion under great velocities. The most important of them all is the increasing of the *weight* of the car, and the proper position of its centre of gravity.

13 X. *Ans. to 13th Cross.* As cars are commonly used, it is proper to construct them so as to be able to use them in any part of any train.

14 X. *Ans. to 14th Cross.* It is not essential to the proper working of the first car in a train, that while it is subjected to the whole draft of the train, its trucks shall have the same freedom of motion that any other truck in the train has. The last truck in a train always has too much freedom of motion, even when the car is well loaded, as I have had occasion to observe, having sometimes suffered great inconvenience, and had illness aggravated, by being obliged to take my seat near the rear end of the last car of the train, whose rear truck had too great freedom of motion, the car having no connection with any other except at its front end, the truck thus being left to find its own position on the rail, without the controlling influence of a car in the rear of it. Under such circumstances, the flanges of the wheels of the truck are brought with much greater violence and frequency against the rails. Consequently the friction is proportionally increased. Nothing would be productive of useless friction more than to allow too great freedom to the motions of the truck. If the whole train is drawn by the trucks, the forward centre-bolt will have a greater strain and friction than the next succeeding one, and so on throughout those of the train; but that friction would be so slight as in nowise practically to interfere with any desirable freedom of motion in swiveling of the truck on the rails.

15 X. *Ans. to 15th Cross.* Practical experience has long settled the fact, that it is not essential, in order to give sufficient freedom of motion to the trucks of all the cars in a train, that the draft should not be applied to nor act through them.

16 X. *Ans. to 16th Cross.* Model "B" represents a greater amount of bearing surface between the upper and under bolster than the specification of Winans's indicates, and less than the drawings exhibit.



17 X. *Ans. to 17th Cross.* Model "B" shows no mode of attaching the draft power.

18 X. *Ans. to 18th Cross.* The peculiar mode of constructing the truck, by the use of two long springs coupling the axles of the wheels, is described by Winans, in his specification, as an essential part of his invention. No other direction is given as to the form of the *spring*, excepting that the shorter leaves of it must be placed over the longer ones.

19 X. *Ans. to 19th Cross.* The use of springs is proper in passenger cars on four or more wheels.

20 X. *Ans. to 20th Cross.* The Chapman patent does represent a railroad car or carriage, in the ordinary sense of these words. It resembles the modern steam passenger car, such as is used on the Worcester Railroad, and some others, I believe, running out of Boston, in which the motive power is placed in one portion of the car, while the rest is devoted to passengers. I see no impropriety in calling it a railroad car. This particular steam passenger carriage has been the subject of a patent, granted on the 2d of December, 1851, to Joseph H. Moore and William F. Parrott, the specification of which invention I prepared for the inventors some years since. I had no hesitation then, and have none now, in terming it a car in the *same sense* or reason that I call the Chapman carriage a car. The trucks of the abovementioned steam passenger car have sufficient freedom of motion to enable them to conform to the curves and irregularities of the road. The model "K" does not represent the windlass upon the platform or on the middle of the car. In other respects I consider it substantially correct. The mode of draft was by fastening a chain or rope to a fixed point between the rails. This rope or chain, thus extended between the rails and fastened at both ends, was passed up through an aperture in the platform of the car, under a pulley, and thence around a drum or windlass; thence down under another pulley, opposite to the first. Giving motion to this windlass caused the car to be impelled forward or backward, and the point at which the tractive power was applied was the roller of the platform, and this was precisely equivalent in its effect upon the car to a draft by the middle of the end of the platform. The author states that this windlass may be applied on a platform at either end of the car, or in the centre of it, and that any self-moving power may be borne in the body of the car in order to give motion to this windlass.

21 X. *Ans. to 21st Cross.* I do not find in either the drawing or description of the eight-wheeled car, shown in plate 4, any representation of a draw-link attached to the end of the body, as shown in model "A," the drawing being a mere sketch, in outline, for the purpose of presenting the running gear; and it being unnecessary to repeat the draw-link, it being shown in other cars.

22 X. *Ans. to 22d Cross.* There is in the drawings and description of Tredgold's treatise, a provision for enabling a truck or wheel-frames of the eight-wheeled cars to swivel laterally and conform to the curves of the road. The drawing is contained in plate 4. The description of it on the opposite page.

23 X. *Ans. to 23d Cross.* I have before stated what is the construction and organization of the Allen steam carriage, and I have stated the parts of which it consists, and their manner of being connected; and I have used the substance of the language of the specification in referring

to or describing those parts in the one carriage which agree with or differ from the corresponding parts of the other.

24 X. *Ans. to 24th Cross.* In describing the Quincy car, I have used the substance of the language of the specification, in referring to the parts of the Quincy and of the Winans car, which agree or disagree.

25 X. *Ans. to 25th Cross.* A mechanic of ordinary skill, in 1830, knowing what was then ascertained, would have known what the requirements and characteristics of a railroad passenger car must have been, to enable it to move safely and smoothly over the curves and irregularities of a railroad, at thirty miles per hour, and to enable it to perform the duties required of the ordinary eight-wheeled cars now in use. He could have derived his knowledge from the eight-wheeled car of the Chapmans, that of Tredgold, and the Quincy car. These, and a variety of existing works on railroad engineering, and which treated on the operative parts of railway cars, together with the actual experience upon the English railways, not only for a long series of years, upon the tram and the edge railroads of the United Kingdom, at slow rates of speed, but also actual experience at high rates on one or more of the English passenger railways, would have readily developed and displayed to the observation of any well-informed mechanic, whose business was the construction of railway carriages, what would be the difficulties to be overcome, and the requirements and characteristics which would be necessary to overcome them, in order to enable the car to move safely and smoothly throughout the whole course of a railroad. Indeed, so well were these requirements and characteristics known, both in the four and in the eight-wheeled car, that a mechanic would have nothing more to do than to take the drawings either of four or eight-wheeled cars, such as are shown in Tredgold, Strickland, or Chapman's patents, or of the Quincy car, and apply to them well known contrivances of springs, as directed in Tredgold. These springs applied to the four-wheeled cars for a particular purpose, would be applied to the eight-wheeled cars for the same purpose.

26 X. *Ans. to 26th Cross.* I do consider the arrangement of railroad car wheels, firmly fixed to their axles, and rotating with them, to be the same in principle as those rotating upon stationary axles, although each mode of arrangement has its peculiar advantages, and both modes have been in use long before 1830, and from that time to the present.

27 X. *Ans. to 27th Cross.* I am told that the Quincy car was drawn by the truck, whenever any mode of draft was applied to it.

28 X. *Ans. to 28th Cross.* I do not consider it a matter of indifference, whether the draft be applied to either the truck or the body. I think it ought to be applied in no instance to the body, but generally speaking rather to the truck, or the king-bolt. When the draft is by the middle of the ends of the body, in turning curves the forward end of one body and the rearward end of the other, being both swung over the outer rail, the line of traction is thrown more or less out of coincidence with the line of forward motion. The tendency of this is to cause the trucks to be thrown off the track, particularly when the engine makes a sudden start in passing a curve. Where the line of traction is from one king-bolt to the other of the trucks of the two cars, it substantially coincides with the mean curve of the rails, or the direction of motion of

the cars. In this case a sudden increase of velocity of the engine has no material tendency to cause the wheels to run off the track.

29 X. *Ans. to 29th Cross.* In the treatises of Wood, Tredgold and Strickland, the draft is represented as applied to the ends of the bodies of four-wheeled cars. The application of such to the bodies of eight-wheeled cars, involves no change of principle, in my opinion, but is only a matter of mechanical skill or application of one thing in one kind of car, in the same manner and for the same purpose for which it has been used in another car.

30 X. *Ans. to 30th Cross.* The application of draft to the body of the car, in a manner precisely equivalent to that which has long been used upon eight-wheeled cars, however defective such mode of draft may be, is fully shown in the drawings of the Chapman patent. It is true that in the plate illustrative of the Chapman car, every part is not repeated upon every figure, such being quite unnecessary.

31 X. *Ans. to 31st Cross.* All the information from books or experience, either before or since the year 1830, would, in my judgment, have taught a mechanic of ordinary skill and knowledge in the construction of cars, and particularly provided he was a man of observation, that placing the wheels of trucks very near together, as compared with the distances at which they had been usually placed, and at which they are described and represented in the Chapmans patent, and the treatise of Tredgold, and as embodied in the Quincy car, and the Allen locomotive, would greatly increase instead of reducing the friction between the flanges of the wheels and the rails, while the carriage was passing over curves.

32 X. *Ans. to 32d Cross.* All the sources of knowledge mentioned in my last answer do not lead to the conclusion that great steadiness of motion, when running at high velocities, is attained by constructing the car body of great length, and supporting it at or near each end upon two trucks, having the wheels of each truck very near together; and this for two reasons: first, such trucks are not capable of steady motion; second, the length of the body has little or nothing to do with steadiness of motion. I have, in my direct answers, explained my views upon this point, and I will only add that any person's experience will show how much the *weight of the load* has to do with producing steadiness of motion.

33 X. *Ans. to 33d Cross.* All the knowledge and experience acquired, either from books or observation, either before or after 1830, tend to show that trucks should not have the greatest possible freedom of movement, in order to enable them to conform to the surface of the rails; and experience, during the whole of this period, has made it equally certain that the trucks may be constrained, not only by the application of draft through them, but by side bearings, brake mechanism, safety chains, etc., without so far interfering with any desirable freedom in their motions as to make these arrangements in anywise objectionable.

34 X. *Ans. to 34th Cross.* No modification in the railroad cars, on four or eight wheels, which existed prior to 1830, was necessary to be made, merely for the purpose of adapting them to be run at high velocities. Running the cars at great speed merely requires proper strength in their parts, but does not require any further material alteration of



them. In order to make any freight car comfortable for a passenger car, it was customary, long previous to 1830, to employ springs.

35 X. *Ans. to 35th Cross.* Not one of the eight-wheel cars which I have described in my former answers, was constructed solely for the purpose of carrying great weights, and dividing the weight equally on eight wheels, in order not place a greater load on each wheel than they and the rails could well bear. In each instance, other and distinct objects were stated in the description, to be attained. One of them, common to all these cars, was the so arranging the wheels in trucks, as to enable them to conform to the curves and angles or irregularities of a railroad, and the consequence of this would be to enable them to bear their loads evenly, smoothly, and safely. All these cars and carriages, whatever the language used in the description of them may be, are obviously designed to accomplish those purposes as well as that of distributing the weight.

36 X. *Ans. to 36th Cross.* I have no personal knowledge what was the actual use to which eight-wheeled cars, previous to 1830, were put.

37 X. *Ans. to 37th Cross.* I have not been employed by any person or corporation to assist in the preparation of the defence of this case, or to collect evidence, nor am I in any way connected with this case, or interested in its result, excepting that I have been requested to make thorough investigations into the principles of Mr. Winans's and other similar inventions, for the purpose of enabling myself to form and express, as a witness in this case, my deliberate opinions upon the subjects of inquiry which might be brought before me.

38 X. *Ans. to 38th Cross.* I hold no office under any railroad company, nor am I in the employ of any.

39 X. *Ans. to 39th Cross.* I have not formed an opinion as supposed in this question. I am not prepared to say but that Winans's patent may be valid, for the mode of connecting the axles of the trucks by long springs in combination with bolsters, whereupon the whole weight of the body is borne upon the centres of the bolster.

40 X. *Ans. to 40th Cross.* I have not stated that I am a railroad superintendent, as supposed in this question.

41 X. *Ans. to 41st Cross.* I have not before seen, heard, read, or heard read, or had stated to me, the foregoing cross-interrogatories, or their substance.

And in answer to further interrogatories, proposed on the part of the Respondent :

[Further interrogatories, page 659.]

1 Ad. *Ans. to 1st Ad. Direct.* I have before stated all I know on this subject.

2 Ad. *Ans. to 2d Ad. Direct.* Certainly not.

3 Ad. *Ans. to 3d Ad. Direct.* It would not.

4 Ad. *Ans. to 4th Ad. Direct.* There is not.

5 Ad. *Ans. to 5th Ad. Direct.* There is nothing.

6 Ad. *Ans. to 6th Ad. Direct.* There is nothing.

7 Ad. *Ans. to 7th Ad. Direct.* I answer all in the negative.

8 Ad. *Ans. to 8th Ad. Direct.* There is a great difference between the mechanical theories inquired of in this question. This difference is



material or essential, for reasons that I have stated in my former answers.

9 *Ad. Ans. to 9th Ad. Direct.* It is not.

10 *Ad. Ans. to 10th Ad. Direct.* It is not. I have already given the reasons why.

And in answer to additional cross-interrogatories on the part of the Plaintiff:

[Further cross-interrogatories, page 664.]

1 *X Ad. Ans. to 1st Ad. Cross.* By the theory of Winans I mean, the close proximity of wheels, his mode of connecting together the wheels in each truck, and the bearing of the load on the centre of the bolster, without the employment of side bearings.

2 *X Ad. Ans. to 2d Cross Ad.* Previously to 1830, railways were principally used for the transportation of freight. Two of them were used for passengers. The speed on these different roads greatly varied.

3 *X Ad. Ans. to 3d Ad. Cross.* No railroads were ever constructed, according to my information, of such materials, and in such a way, that concentration of the weight of the cars and locomotive was permissible whenever it could be avoided. Distribution of weight is an object of prime importance on railroads as now constructed.

4 *X Ad. Ans. to 4th Ad. Cross.* Prior to 1830, there were two railways in England upon which passengers were habitually carried. They were the Stockton and Darlington, and the Liverpool and Manchester roads.

5 *X Ad. Ans. to 5th Ad. Cross.* Prior to 1830, locomotive engines, stationary engines, and horse power, were used as a motive power of trains of cars.

6 *X Ad. Ans. to 6th Ad. Cross.* No rate of speed could well be called an average speed for these different roads.

7 *X Ad. Ans. to 7th Ad. Cross.* I have not designed railway cars.

R. H. EDDY.

## DEPOSITION OF SAMUEL COOPER.

I, Samuel Cooper, of Roxbury, in the District of Massachusetts, thirty-seven years of age, mechanical and civil engineer, on oath depose and say, in answer to interrogatories proposed to me on the part of the Respondent, in the case of *Ross Winans v. The Eastern Railroad Company*:

[Interrogatories, page 649.]

1. *Ans. to 1st Int.* My name is Samuel Cooper. I am thirty-seven years of age. My place of business is 39 State street, Boston. My residence, Roxbury. My profession is that of mechanical and civil engineer.

2. *Ans. to 2d Int.* I have for many years been engaged in different branches of civil engineering, and have given my whole time to the study thereof. From 1842 to 1848 I was employed under the Engineer Department of the U. S. Army. During the time that I was so employed, I had charge of various public works, including the triangula-

tion of the Potomac river below the city of Washington, the constructions at Fort Washington, and the topographical survey of the site and vicinity of Fort Madison, in Annapolis harbor, and the construction of that fortress.

From 1848 to the fall of 1852, I was in the examining corps of the U. S. Patent Office, in which position I was called upon to examine all applications for letters patent upon subjects connected with the running gear of railroad cars; and while principal examiner it became my duty to examine and compare the models, drawings, and specifications of all applications for letters patent upon subjects connected with the various branches of civil engineering, including all matters relating to railroad cars, and their running gear, with a view of determining questions of novelty or interference. In the performance of these duties, I was obliged to inform myself, not only of the past history of these branches, but also to keep pace with their progress. At present I am engaged in the preparation of specifications and drawings for letters patent, and am often called upon to give opinions upon the novelty and practicability of mechanical inventions.

3. *Ans. to 3d Int.* I am.

4. *Ans. to 4th Int.* I have examined the same many times during the last five years, in connection with my duties as examiner in the patent office. And I have also recently examined the same.

5. *Ans. to 5th Int.* I have examined the model marked "B;" and I consider it a true representation of the car described in Winans's specification, except that the bearing of the upper bolster upon the lower one is extended somewhat farther from the centre of the king-bolt than is warranted by the description.

6. *Ans. to 6th Int.* The parts which I consider essential and elemental, are a car body and two four-wheel trucks, with rigid frames. With regard to the arrangement of these parts, the car body should be supported by the two trucks, which should be permitted to turn on a centre pin, to enable them to conform to the curves of the road; it should be sufficiently long to allow the trucks to swivel without interference with each other.

Side bearings are also, in my opinion, both essential and elemental, to prevent the car body from rocking from side to side, and also to control the swiveling of the truck, and to prevent it from being too easily vibrated.

I do not consider any particular distance between the axes of the wheels, as either essential or elemental, except that it should not be so short, as to wobble upon the track, while there are reasons entirely independent of considerations of friction, or easy running, or safety, which limit the distance of the axles, and render it expedient not to extend it much beyond that which it has upon the cars now generally in use, upon the roads throughout the United States. These are—First, A short truck can be built more cheaply, and will be much lighter than a large one, as in proportion as the length of the truck is increased, the timber of which it is constructed must be made heavy. Second, The trucks cannot safely be allowed to project beyond the end of the platform, as the rear wheels of one car would interfere with the forward wheels of the next car. If, therefore, long trucks were to be employed, the pivots would be thrown so far from the ends of the plat-

form, that the cars would be very much weakened, as there are no practicable means of supporting that portion of the car which would project beyond the king-bolt; between the king-bolts, the body being trussed, is easily supported, but this mode of support cannot be adopted at the ends; the trucks therefore must not be made so long as to project beyond the ends of the platform, nor yet to have their king-bolts thrown too far in from the ends of the car body, leaving too great a length to hang over the truck unsupported.

This consideration limits the length of the truck, or the distance between the bearing points of the wheels, and will always keep it at the minimum which can be economically and safely adopted.

3d. It is necessary, such is the height of the floor of the car above the ground, that that there be steps at the ends, for the accommodation of passengers. These cannot be allowed to project beyond the side of the car, and must therefore cut into the width of the platform; and in order that this may be done, the truck must be placed still farther back from the end of the platform, so as not to interfere with the steps. These considerations limit the length which can be given to the trucks, particularly of passenger cars; though on account of the friction alone, the distance between the axles might be made much greater than it now generally is.

7. *Ans. to 7th Int.* So far as relates to the *trucks*, those used upon the Eastern Railroad have various improvements upon them, which have been invented since the issuing of Winans's patent, amongst which may be enumerated safety beams, to hold up the axles in case of breakage; patent brakes and car wheels; lubricating boxes; swinging bolsters; soft metal bearings; India rubber springs. There are also differences of construction which are not the result of recent invention, as the present modes were known *before* the issuing of Winans's patent. Amongst these may be enumerated, the rigid truck-frames; pedestals and springs, so arranged that the axles may be kept at a uniform distance from each other.

So far as relates to the car body, those at present in use are of more than twice the length of those recommended in Winans's patent, which was about the same as that of the double-truck eight-wheel car shown in Tredgold, in 1825. There are various other improvements, having for their object the safety and comfort of the passengers, which are familiar to every one acquainted with the railroad cars at present in use, and which need not, therefore, be enumerated.

8. *Ans. to 8th Int.* They are so constructed as to be removable from the trucks, by taking out the king-bolt, which latter I am informed is generally about seven feet from the end of the platform.

9. *Ans. to 9th Int.* The eight-wheel cars now generally in use, have side bearings, the object of which is: *Firstly*, to prevent the body from rocking to and fro.

*Secondly*, To control the swiveling of the truck.

*Thirdly*, To prevent the body of the car from leaning too far over towards the outer rail while passing round curves.

*Fourthly*, Side bearings better enable the vis inertia of the car to keep the wheels from being thrown off the track by the unbridled elasticity of the springs.

If the truck be allowed to turn too freely beneath the car, particu-

larly if the wheels be near together, it will be caused to vibrate constantly around its centre, the flanges striking first one rail and then the other. This will occur both upon the straight track and upon the curves.

The idea entertained by some that the effort of the rails to guide the wheels during the whole passage of the truck round the curve, causes the flanges to grind constantly against the rails, is entirely erroneous. If the inclination of the tread of the wheels be adapted to the radius of the curve, (to effect which adaptation is the object of the conical form given to the tread of the wheels) and if, at the same time, the freedom of swiveling of the truck be limited by the use of side bearings, the truck will be thrown, at the instant of entering a curve, into a position necessary to enable it to traverse that curve, and the flanges will not necessarily be brought into contact with the rail, by the effort of the latter to guide the wheels, until the straight track be reached, or until the radius of curvature change; although the whole structure may be carried over against the outer rail, by the centrifugal motion of the car, and the flanges of all the wheels may thus be made to bear up close to the side of the rail.

This equable motion cannot take place when the trucks are allowed to swivel without the control of side bearings, as the concussions between the flanges and rails, and also between the treads of the wheels and the ends of the rails, at the junctions of the latter, will revolve the truck so easily that the opposite flange will be thrown over upon *its* rail, and thus a constant wobbling or unsteady motion of the truck will be the consequence. With regard to the object for which railroad wheels are made conical, viz. to cause the wheels upon the inner and outer track to run together without swiveling the truck, so as to force the flange of the forward outer wheel to grind upon the rail, which object is referred to above, see the following extract from Tomlinson's Cyclopaedia, Vol. 2, page 548: "In moving over a curve at a high rate of speed, the effect of centrifugal force tends to throw the train off the line. There are also other objections to curves, which engineers have endeavored, in various ways, to remedy. For example, in moving on curves the wheels on the inner rail will attempt to describe a smaller curve than the wheels on the outer rail, and will thus be made to rub backwards and forwards on the rail, while the outer wheels are getting over the excess of space; this produces torsion of the axles and straining of the frame, and the parts connecting it with the axles. Attempts have been made to remedy this source of evil, by giving a conical form to the tires of the wheel, and by slightly raising the outer rail. The tires are so arranged that the bases of the cones are towards each other, and it is assumed that when the centrifugal force drives the flange of the outer wheel towards the edge of the rail, and withdraws the flange of the inner wheel from its rail, the diameters of the wheels are rendered practically unequal, in the exact proportion required to get rid of the dragging, which takes place when cylindrical wheels of equal diameter, locked together on the same axle, are made to describe curves." The effect is as the distance of the axles.

10. *Ans. to 10th Int.* Check chains are employed for the purpose of preventing the corner of the truck from falling, in case of the breakage of a wheel, and also to prevent the truck from being turned too far



beneath the car body, in case the car were thrown off the track. They would also preserve the body from being thrown off the truck, in case of the breakage of a king-bolt.

11. *Ans. to 11th Int.* The car body should be sufficiently long to enable the trucks to swivel without interfering with each other, and beyond this there can be no invention in making it a little longer or a great deal longer. It is well known to mechanics that as the length of the body is increased, the strength of the car frame must also be increased, and that the rapidly increasing weight of the latter offers a limit to the length which can be practically useful. It is found that when they are constructed of too great length, they are liable to excessive vertical vibration in the centre, and that they do not run steadily.

There is therefore a length somewhere between the two extremes, which is most advantageous to be used; that at present chosen for the cars is more than double the length proposed in Winans's specification, although the patent specifies no particular length as material.

The great invention which distinguishes the eight-wheel from the four-wheel car, viz. the use of two trucks swiveling under one body, put it in the power of the mechanic, without the exercise of any additional invention, to extend the distance between the bearing points of the body upon the trucks to any distance that necessity, convenience, or fashion might require. The only practical limit to this extension was, on the one hand, not to make the distance of these bearing points so short that the trucks could not swivel without interfering with each other; and on the other, that the structure should not be so cumbersome and unwieldy, or so slender and vibrating, as to render it dangerous to passengers, injurious to the road, or wasteful of locomotive power. All that required invention was the obtaining such a construction of the car, as would have the capacity of indefinite extension, viz. the capability of placing the supports under each end, at any given distance from each other, without the car at the same time losing its capacity to pass the curves and irregularities of a railroad. This is accomplished by using the swiveling trucks instead of two axles fixed to the body. Such a capacity of the car being once discovered, the increasing or diminishing either the length or the width of the body, obviously in nowise varies its principles of construction or operation. It is a great mistake to suppose that increasing the *length* of the body is essential to increasing its steadiness of motion. This is obvious from practical experience as well as from theory. The short bodied four-wheeled cars, have been used in England from a period anterior to the construction of the first railroad in this country, and some of them are run at rates exceeding any attained in the United States with the eight-wheel cars, and it is acknowledged that the English cars run more steadily even at those rates than the long cars of the United States.

There are various causes, irrespective of the length of the car, which control the steadiness of its motion; amongst them are: 1st, Absolute weight. 2d, The height of its centre of gravity above the rails. 3d, The width of the bearing points of the body on the truck. 4th, The use of springs, and their adaptation to the weight they have to bear, and the nature of the forces impinging upon them. 5th, Another important element of steadiness in the movement of the body, is the regu-

larity and steadiness of the movement of the trucks. If these be so constructed and proportioned as to wobble upon the track, and vibrate from side to side, the cars which they support can manifestly not run steadily. 6th, The mode of coupling the cars together in trains, and the line of traction between the cars, has much to do with the degree of steadiness with which the cars run. It is also obvious that, whether the body be longer or shorter, if one end be raised a given amount, the middle will be raised one half that amount, and the other parts of the car in a corresponding degree, whatever the length of the body may be. The same may be said of the lateral motions of the car. When one truck is moved to one side or the other, the car body will pivot upon the other truck, and all intermediate portions of the car will move an amount proportionate to their distance from the truck which has received the sidewise motion. 7th, And finally, the structure of the road itself, the nature of its curves, grades, foundation, and superstructure, are most important elements in the production of steadiness of motion; as are also the nature of the brakes made use of, and the manner in which they are applied, and the speed at which the cars are run.

12. *Ans. to 12th Int.* Such construction would be unsafe and impracticable for several reasons. It is known that steel springs cannot be uniformly trusted, and that they will often suddenly fail, even after having continued a long time faithful. Should such an accident occur to one of the springs of Winans's truck, when in rapid motion, the destruction of the car would be inevitable; or should a single wheel or bolster or king-bolt break, or even the connection between one end of a spring and the axle-box give way, the car must fall to the ground and be destroyed. Any or all these accidents might occur to the cars in use upon the Eastern Railroad, or to those generally in use throughout the United States, without any disastrous consequences, as the rigid frame of the truck and its appurtenances would still keep the axles parallel to each other, and the wheels upon the rails.

For other reasons than those above specified, the method of constructing the trucks, by connecting the axles by means of springs, as described in Winans's specification, would be highly vicious and unsafe; for in addition to their legitimate duty, that of relieving and reducing the force of the vertical shocks to which the car may be subjected, and sustaining the weight of a vertically imposed load, the springs would be called upon to perform the additional duty of resisting all the other strains to which the truck-frame could be subjected, all of which would come upon them at their very weakest point, and which have been found in practice to be so great as to demand that the truck-frame be not only made rigid, but also so thoroughly braced as to resist all efforts of the various forces to which they are subjected, to wrench them or twist them out of shape. *It is not possible* that these two duties can be simultaneously performed by the same piece of metal, for if it be sufficiently elastic to *act as a spring* it cannot be sufficiently strong to resist the torsion to which it is exposed, and to bear the great strains to which the truck-frame is subjected. On the other hand, if it be made sufficiently strong for the last named purpose it becomes a rigid mass of metal, and loses its properties as a spring, to all practical intents and purposes.

Another serious objection to this mode of construction and one

which would be fatal to it were the attempt made to introduce it, arises from the necessity which exists of having the axles parallel to each other in the truck. It is found in practice that a deviation from this rule will throw the truck off the track. In the Winans truck, it is my opinion that it would be found impossible to maintain the requisite degree of parallelism between the axles. This defect alone would render the said mode of construction exceedingly unsafe, if not absolutely impracticable; and it is rendered still more so by the fact that it would be impossible to apply to a truck so made any of the brakes now in use, and particularly the one shown on the drawing attached to Winans's patent; for were they applied either between the wheels or outside of them, the force put upon the brakes would act with such great leverage upon the springs when they are joined to the upper sides of the boxes, and at their very weakest point, that they would be in danger of being snapped or bent out of shape at this point; and when, from any of the causes enumerated above, the wheels upon one side were spread farther apart than those upon the opposite side, the brakes upon only one side of the car could be brought to bear upon the wheels at the same time. These are all fatal objections to the proposed mode of construction, and I therefore answer this question by stating it to be, in my opinion, entirely impracticable and unsafe.

The foregoing are some of the disadvantages which would result from connecting the axles of passenger cars by long springs, as described in the specification of Winans's patent.

13. *Ans. to 13th Int.* The drawing does not show a car constructed in the manner described and recommended, but contradicts the specification in a great variety of essential particulars. Amongst others, Mr. Winans's specification commences by stating that "his improvement is particularly adapted to passenger cars," and he then goes on with "an exposition of the difficulties heretofore experienced in the running of such cars at high velocities." The passenger car alone is described in the specification. The drawing represents a freight car and no passenger car. The specification places the wheels very near to each other, the spaces between their flanges being no greater than is necessary to prevent their contact. In the drawing, the wheels are sufficiently far apart to allow of the introduction of brakes. In the specification the wheels are connected together by means of strong springs; in the drawing an entirely different construction is employed; the wheels being set in rigid truck-frames.

In the specification the ends of the springs are bolted to the upper sides of the journal boxes, and the centres of the springs are bolted to the ends of the bolster. In the drawing the centres of the springs are bolted to the boxes, and the ends are left free to play in pockets, upon the under side of the rigid truck-frame.

In the specification there are but two springs to each truck, which springs take the place of the ordinary side timbers of the truck, and receive and bear all the torsion and strain of every kind to which the side timbers can be subjected, in addition to fulfilling their duty as springs. In the drawing there are four springs which perform the legitimate duty of springs, and no other. In the specification the longer leaves of the springs are placed downwards, and are surmounted by the short ones. In the drawing the longer leaves are above, the shorter



ones beneath. The specification describes two bolsters, through each of which a centre pin or bolt passes down, thus allowing them to swivel or turn upon each other, in the manner of the front bolster of a common road waggon.

The drawing shows a different construction; the bolt does not pass through either bolster, but forms a part of the upper, and enters a socket in the lower one.

The specification describes no side bearings.

The drawing shows side bearings, which extend half way from the centre-pin to the bearing points of the wheels.

The weight of the car is said, in the specification, to be borne on the centre of the bolster. In the drawing, it is distributed over a distance equal to half the length of the axles. The specification makes no mention of any method of draft. The drawing shows a method of draft from the middle of the end of the platform. The specification makes no mention of brakes, but describes a method of construction to which it would not be practicable to apply any brake in use. The drawing shows an entirely different construction with a brake applied to it. Neither the brake nor the draw-bolt is indicated by any letter of reference upon the drawing.

Finally, the construction described in the specification and that represented in the drawings, differ so essentially from each other, in their mode of operation, that the one could not be characterised as a modification of the other.

14. *Ans. to 14th Int.* I have.

15. *Ans. to 15th Int.* I have examined the said model. It truly and correctly represents the railroad carriage described in said book and drawing.

16. *Ans. to 16th Int.* Without any possible doubt, a car builder of ordinary skill and knowledge in his profession, would be able, by the aid of said specification, without the necessity of exercising his own faculties of invention, to construct eight-wheel railroad cars, substantially the same as those now in use upon the Eastern Railroad and other railroads generally, so far as respects the manner of arranging and connecting the eight wheels, and the connection of the trucks with the body of the cars. The rigid truck-frame, constructed substantially like those of the present day, is both figured and described; the distance between the bearing point of the wheels being about equal to the gauge of the track. The car body has side-bearings upon the truck, similar to those now in common use, and the trucks were connected with the car body by a king-bolt, upon which they were allowed to turn to accommodate themselves to the curves of the track. The draft was by the body, from the middle of the end of the platform.

The drawing represents a six-wheel car; and it is stated, in the specification, that two four-wheel trucks, such as described, may be used under one body, thus embracing every thing essential and elemental in the eight-wheel cars, as at present constructed.

The size of the wheels in Chapman's car is immaterial to the principles of the invention, and it is obvious that a mechanic could easily substitute larger in place of smaller wheels, without changing their bearing-points, or altering the principles of action or construction of the trucks.



With regard to the objects and purposes for which the invention was intended, the Chapmans, in the first place, suggests the idea of drawing trains of carriages in these words: "It shall necessarily draw the said carriage, with any others that may be attached to it;" thus indicating the use of some carriage, as applicable to transport the motive power, while others in the train should be used for transportation of freight. It then goes on to state that more than four wheels may be used under one carriage, so arranging themselves that while they reduce the pressure on each wheel, they may at the same time rest equally and move freely round curves, on six or eight wheels.

That part of this structure which the Chapmans claim to have invented themselves, has reference to the method of drawing the car, which, as before stated, was by means of a windlass, stationed either at the front or rear end of the platform, or at the middle, and it was to be drawn either by chains or ropes, which passed down through the centre of the platform, forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course.

It would be difficult to describe the eight-wheel car in use at the present day, so far as relates to the organization and arrangement of the running gear, in more appropriate language than that used by the Chapman patent.

Entertaining these opinions, I cannot hesitate to say that a mechanic, having the Chapman patent before him, in 1812, would have been able to make, without invention, such cars as are specified in the interrogation.

17. *Ans. to 17th Int.* The Chapman carriage has side bearings, centre pivot, and rigid, rectangular wheel-frames.

18. *Ans. to 18th Int.* I have measured the distance between the bearing points of the wheels upon the Chapman truck, and I find it less than the gauge of the track.

19. *Ans. to 19th Int.* The model may be made to represent both the six and the eight-wheel carriage, described by the Chapmans, by removing the two wheels, and substituting, in the manner directed in the specification, a second four-wheel truck, similar to the one described.

20. *Ans. to 20th Int.* I have examined the treatise of Tredgold, and I find both drawings and description of a double truck, eight-wheel railroad car.

21. *Ans. to 21st Int.* The component parts of the eight-wheel car, described and represented by Tredgold, are a body and two rigid four-wheel frames, similar to those described by Chapman, and to those now generally in use. In order to describe the manner in which these parts are arranged and put together, and the mode in which said car is calculated to operate, it is proper to refer, not only to the circumstances and requirements which induced Tredgold to propose this car, but also to the language which he uses in the context, as well as in the immediate description of the car. Upon page 179 he says, "plate IV, Fig. 26:—A diagram to show how a waggon may be made with eight wheels, so that the stress of each wheel on the rails of a railroad may be equal. The body of the waggon rests on the wheel frames at A A, and is connected to them by an axis on which the frame turns, when, from an inequality, the axes of the wheels are not in the same plane."

It is necessary, in the first place, to inquire what these inequalities

were, to which Tredgold refers; for it is absolutely certain, that he *intended* to describe a car, with eight wheels, placed in frames, having the ability to turn whenever the axes of the wheels of the two trucks were thrown out of the same plane, by *any* of the inequalities found upon railroads, and without altering the stress upon each of the eight wheels, as he expressly says so. I cannot presume that any one would suggest that an engineer of Tredgold's eminent knowledge and experience, could have been mistaken upon such a point, or that he could have stated difficulties, and then proposed a remedy which was entirely inadequate to remove them, and this after the description of the Chapman car had been published in the scientific journals of the country for ten years, which car was entirely adequate to remove the difficulties in question.

The *first* species of inequalities which exist upon railroads are those which occur where the level of the road changes, as at the foot of inclined planes &c. With this species of inequalities, Tredgold was perfectly familiar, for he mentions them constantly through his work, as on pages 101 to 106, and elsewhere.

The *second* species of inequality, and one which occurs on all roads having curves, is described by Tredgold, upon page 135, as follows:—"When a considerable degree of curvature is given to a railroad, the rails of the outer curve should have a slight rise to the middle of the curve, and the rails should be stronger in a lateral direction in both lines. The object in making a slight ascent to the middle of the curve, is to counteract the tendency of the carriage to proceed in a straight direction," &c.

The *third* class of inequalities are those which occur, more or less, upon every road, the rails of which have been laid for some time, and consist in the sinkages of the way, at the junctions of the rails, produced by the "hammering" of the ends of the rails upon the chairs. These are spoken of by Tredgold, upon page 43, as "unevennesses at the joints." It thus appears that all these inequalities were well known to Tredgold. Upon page 94, Tredgold discusses the propriety of enlarging railroad cars, and states the difficulty in the way of so doing to be, that there is a limit to the weight which can be put upon each wheel, and consequently if the length of the cars be increased, the number of wheels must also be increased; as an increase of weight upon the wheels above a certain amount, which he specifies on page 95, would endanger their destruction. The most obvious method of doing this would be by using an additional number of axles, running like the two axles of the four-wheel car, in boxes secured to the carriage body; but in this case, when the carriage encountered any of the abovementioned inequalities, a portion of the wheels would be raised from off the track, or at least relieved of a portion of the weight usually borne by them, and an additional stress would be put upon three or four of the wheels, which would be called upon to sustain all or nearly all the load, and it would be as hazardous to overload these wheels for a single instant, as to do it constantly. Tredgold then suggests the use of eight-wheel-double truck cars, which he says "will allow the *greatest possible change of level* on the rails," and also that "the body rests upon the wheel-frame, upon the middle of its length, and is con-

nected to them by an axis on which the frames turn, when from *any inequalities* the axes of the wheels *are not in the same plane.*"

It becomes necessary now to inquire, *first*, in what manner the above mentioned inequalities of the road can effect the truck so as to throw the axes of the wheels "out of the same plane;" and, *secondly*, how an eight-wheel car must be constructed in order to run as Tredgold's was designed to, with an unvarying pressure upon the wheels.

The first class of inequalities mentioned above, are those which occur upon a change of grade, upon the straight track. Upon entering such a change, in order that the wheels of the forward truck of an eight-wheel car may sustain an unvarying stress, as it is absolutely necessary should be the case, it would be requisite merely to attach the trucks to the car body, by means of transverse axletrees equidistant from and parallel with the axles of the wheels, upon which axletrees the trucks might rock vertically at their front and rear ends. To enable the cars to pass the second and third classes of inequalities mentioned by the author, it is necessary that the trucks be connected with the body by an axletree or rocker, running lengthwise of the car, in order that the wheels upon either side of a single truck may sink down into the inequalities, or rise up on one side as it enters a curve, while the wheels of the other truck are still upon the horizontal portion of the track. This could not take place were the trucks and car-body connected by the axletrees parallel to the axes of the wheels; and the only way in which the trucks could be enabled to possess both these capabilities, that is of rocking in two directions at right angles to each other, for the purpose of enabling them to turn when from *any* "inequality the axes of the wheels are not in the same plane," as Tredgold says they will do, would be by connecting the car and trucks together by king-bolts, in a manner similar to that adopted by Chapman, in 1812. It is certain that Tredgold was familiar with the Chapman carriage; for, *firstly*, he quotes constantly, in all his works, the work which contains the Chapman patent, and has even referred to it a number of times in his treatise upon railroads, which contains the description of the eight-wheel car in question. *Secondly*, The Chapman carriage was not simply published, and then suffered to die; it was put into practice and worked, and as Tredgold was intimately acquainted with all the railroad matters of the kingdom, he must have also known of this; and this is rendered certain from the fact that he constantly, through his work on railroads, quotes and refers to Chapmans' work upon the same subject.

There is also another consideration which renders it almost certain that at the time he was writing what he did of the eight-wheel car, Tredgold had Chapmans' patent before him. Chapman having described his six-wheel carriage, says, in order that "it may rest equably, or nearly so, on each of its wheels," that "two-thirds of its weight should lie over the central point of the four wheels;" the other third consequently resting upon the single pair of wheels; and that if two trucks are made use of, the load may be laid "equably upon both."

Tredgold having described his eight-wheel car, makes precisely the same suggestion with regard to it, (page 94); that is, that the carriage may be changed at will from an eight to a six-wheel car, and that the load may in either case be adjusted so that an equal pressure may be



placed upon each pair of wheels; he says: "If one frame with its four wheels be removed, and an axis with two wheels applied in its place, the carriage would have six wheels, and it would be easy to adjust the load so that the pressure on each pair of wheels would be equal."

It is not then, in my opinion, possible that Tredgold, with his entire familiarity with all the circumstances of railroads, and all the exigencies of railroad cars, should have stated the difficulties to be overcome, and then proposed in the next paragraph a remedy which was entirely incapable of removing them; that he should have stated that his car would run upon "any inequalities" of railroads, when he himself must have known that it would not run upon a class of inequalities which he had just described, and which are by far the most numerous of all those that occur upon railroads, and which his car could by no possibility accommodate itself to, unless the trucks were allowed to turn upon the vertical axis—particularly when it is perfectly certain that he had before him and was familiar with the Chapman carriage, which, without any doubt or question, could accommodate itself to any and all the inequalities which Tredgold cites, or which could occur upon railroads.

To that portion of the interrogatory which relates to the manner in which the component parts of this car are arranged and put together, and the mode in which the car is calculated to operate, I reply, therefore, the trucks are placed beneath the body and near the ends thereof; that they are connected to the body by a king-bolt, which enables them to accommodate themselves to any inequality and curve of the road; and finally, that the car is calculated to operate upon straight track and curve in a manner precisely similar to that in which the double-truck cars of the present time operate, except, perhaps, that the trucks having no side bearings for the car body, will swivel with more ease than those now in use, though not so freely as Winans's trucks, his wheels being placed much nearer together than either Tredgold's or those of the cars in general use throughout the United States, so far as my observation has extended.

To that portion of the interrogatory which relates to the proportions of this car, I reply: if the diameter of the wheels in Tredgold's carriage be taken at thirty-two inches, which is that given upon page 16 of his work, for the wheels upon the Surrey Railroad, and which varies but slightly from those now generally in use (thirty-three inches), and a scale be made of this distance, we shall find the distance between the bearing points of the wheels to be about five feet four inches, or about midway between the extremes which Tredgold proposes, upon page 120, for the gauges of the truck for freight and passenger cars; being a few inches more than the one, and a few inches less than the other; while it is nearer to the gauge in most common use at the present day, than to either of those given by Tredgold. The distance between the bearing points of the wheels may then be said to be about equal to the gauge of the track.

With this same scale the length of the car will be found to be between twenty-one and twenty-two feet. If the wheels be taken of any of the larger sizes proposed by Tredgold, the length of the car will be much greater.

22. *Ans. to 22d Int.* The model marked "A" is a correct repre-



sensation of the car described by Tredgold. The body rests upon the wheel-frames, to which it is connected by an axis, on which the frames turn. There is no method of draft shown in Tredgold's drawing; but the draft by the body was well known, and had been before applied to the Chapman car, which was similar to Tredgold's. The four-wheel cars shown in Tredgold necessarily draw by the body, and are so represented. If a different method of draft had been intended for the eight-wheel car, it would have been so stated. As it is not, it is to be supposed that the draft which had already been applied to the eight-wheel car, by Chapman, was intended to be applied to the one subsequently described by Tredgold.

I have examined the model marked "C." It is not a correct representation of the car described in Tredgold. There is no axis on which the frames may turn, as described by Tredgold, that the truck may accommodate itself to the curves of the road; *but* there is a horizontal axletree, on which the wheel-frames may rock, but which will not enable it to accommodate itself to the curves of the track, and is, as far as they are concerned, equivalent to fixing the boxes in which the axles run, to the car body; which method of construction it was the very object of the "wheel-frame" mentioned by Tredgold, to do away with. This portion of the interrogatory has been more fully answered in my reply to the twenty-first interrogatory.

23. *Ans. to 23d Int.* I have made the required comparison, and find the Tredgold car substantially identical in its mode of operation and in its mechanical principles with those at present in use upon the Eastern Railroad, and in general use in this country, so far as regards the running gear. The Tredgold truck has the rigid wheel-frame, the distance between the bearing-points of the wheels being a little less than the gauge of the track.

The car body is much longer than that of the ordinary four-wheel car, and rests upon the wheel-frames, to which it is connected by a vertical axis, on which the frames turn. The essential elements are the same in the Tredgold car and in those now generally in use, and the proportions of the parts of the trucks are the same, or nearly the same in each.

There are no side bearings described or represented in Tredgold; these had, however, been well known since the publication of Chapman's patent, in 1814.

24. *Ans. to 24th Int.* The Tredgold car is calculated to conform to all the irregularities of railroads; as also to answer the purposes and objects set forth in said Winans's specification, as designed to be accomplished by him; that is to say, in the words of Winans's patent, to run with the least practicable friction between the flanges of the wheels and the rails upon all parts of the road, and to "cause the body of the car or carriage to pursue a more smooth, even, direct and safe course than it does as cars are ordinarily constructed, both over the curved and straight parts of the road."

25. *Ans. to 25th Int.* I am familiar with Fairlamb's patent, and have recently examined a certified copy of the same. This is a double-truck railroad car, and fully illustrates and covers everything embraced in Winans's patent, except the peculiar arrangement of the springs in the trucks, and the bearing the whole weight upon the centre of the bol-

ster. In each truck the wheels are placed very close together. There are other supposed improvements contained in the patent, which it is not necessary here to notice.

26. *Ans. to 26th Int.* A mechanic of ordinary skill in car building, would be enabled, with a knowledge of Fairlamb's patent, and without exercising invention, to construct eight-wheel double-truck cars, substantially like those used by the Eastern Railroad; and such cars would embody the essential principles of the eight-wheel railroad cars now in common use; they would, in common with the Winans's car, be liable to the serious objection that the bearing-points of the wheels would be too near together for steadiness and safety; but it would not require invention to correct this fault, but only the exercise of ordinary mechanical skill, knowledge, and judgment.

With regard to the latter portion of this question, whether they would "attain the beneficial results pretended to be obtained by said Winans, in his said patent," I reply, that they would attain such results in a far greater degree than Winans's truck could do; for while they would have one of the peculiarities which are considered objectionable in the Winans truck, viz., the extreme proximity of the wheels, they would be free from the other objectionable feature of Winans's truck, that is, the spring connection of the axles. Fairlamb has shown, in one of the trucks, the axles secured in a rigid wheel-frame; the other truck is introduced to illustrate an alleged improvement in the mode of arranging the bearings of the axles.

Taking the car as shown in Fairlamb's drawing, discarding this improvement, and spreading the wheels further apart, a mechanic of ordinary skill would have nothing to do in constructing eight-wheel double truck cars, substantially similar to those now generally in use, but to follow the drawings.

27. *Ans. to 27th Int.* I have examined the model of the Allen steam carriage, but have not seen the drawings inquired of. The mechanical principles of the construction and arrangement of the running gear are substantially the same as those of the railroad cars now in general use, and it is calculated to attain the same beneficial results. It has a long body, supported by two four-wheel trucks, which are connected with it by king-bolts, which enable the trucks to swivel to accommodate themselves to the inequalities and curves of the road. It contains, in its construction and organization, all that is necessary to produce the beneficial results stated and claimed to be accomplished in the said Winans's specification, dated October 1, 1834. The answer to the latter portion of this interrogatory, as to "what part, if any, of the invention described by the said Winans is embodied in the Allen engine, will depend upon the construction put upon the Winans patent. If it be construed to cover the general principles of construction and operation of the eight-wheel double-truck car, then the Winans patent is entirely embodied in the Allen engine; both having a body sufficiently long to enable the trucks to swivel under it, without interference with each other, and connected with the trucks by king-bolts, for the purpose of allowing them to accommodate themselves to the inequalities and curves of the road. If Winans's patent be construed to cover merely the elastic truck described in his specification, as made with long springs, and the bearing of the whole weight of the load upon the cen-

tre of the bolster without side bearings, then no part of the Winans invention is embodied in the Allen engine.

28. *Ans. to 28th Int.* I have examined the model marked "G. Bryant." It consists of a car body or platform, resting upon two four-wheel trucks, the latter being connected with the platform by means of king-bolts, for the purpose of enabling them to accommodate themselves to the irregularities and curves of the track. It is fully adapted to pass all the inequalities and curves, as well as the straight track of the roads, and is constructed and operated upon the same mechanical principles as the cars used by the Eastern Railroad, a model of which, marked "B. F. Hallett, Commissioner, E. R. R., No. 1," is now shown me, and those now in general use in the United States.

29. *Ans. to 29th Int.* All that is material in the car described by Winans, is embodied in the Quincy car; there are certain peculiarities in which Winans differs from the Quincy car, as well as from those used by the Eastern Railroad. Winans describes a spring truck. The Quincy car has a rigid wheel-frame; the former bears the weight of the load on the centre of the bolsters; the latter has, in addition, side-bearings; but all that is essential in the Winans car is embraced in the Quincy car.

30. *Ans. to 30th Int.* A mechanic of ordinary capacity and a knowledge of car building, having knowledge of the Quincy car, would have been able, in 1829 and 1830, without the exercise of his own inventive faculties, to construct double-truck eight-wheel cars, substantially like those now in general use, so far as regards the arrangement of the wheels and the connection of the wheels with each other, and of the trucks with the body of the cars.

31. *Ans. to 31st Int.* I have examined Wood's Treatise, published in 1825; Tredgold's Treatise, published in 1824; Strickland's, published in 1826; and in all of them is shown a method of drawing the cars then in general use, by a coupling from the middle of the ends of the bodies. The Chapman car, patented in 1812, which was a double-truck eight-wheel car, substantially similar to those now in general use, also draws by the middle of the end of the body.

32. *Ans. to 32d Int.* I have examined the treatise of Wood and the works of Tredgold and Strickland, with especial reference to the distance of the bearing points of the wheels upon the rails.

In Strickland it is slightly less than the gauge of the track.

In Wood it is about equal to the gauge of the track.

In my answer to the 21st interrogatory, I have already shown that in the Tredgold car the distance between the bearing points of the wheels is about equal to the gauge of the track.

33. *Ans. to 33d Int.* Both springs and pedestals arranged substantially like those now in use upon the cars of the Eastern Railroad, are represented in Wood's Treatise, English edition, 1831, and in the model of the Allen locomotive.

34. *Ans. to 34th Int.* The method of fixing the wheels upon the axles and causing the whole to revolve together, is distinctly shown in Strickland (1826), plates 51 and 52.

That this method of hanging wheels was as well known as the mode of running them upon fixed axles, previous to 1830, may be gathered from the following passage from Tredgold (1824), page 103:—"If the



road be straight it is no matter whether the axles revolve or not; but as Dr. Young has remarked, whenever the motion deviates from a straight line the wheels that are fixed on a single axis must one of them be dragged forwards and the other pushed backwards; therefore we would prefer making the wheels revolve on fixed axles," &c. This same difficulty is acknowledged at the present time; but there are inconveniences connected with the adoption of fixed axles which outweigh the advantages, and the revolving axles are still in use.

In Brewster's Edinburgh Encyclopedia, published in Edinburgh, in 1830, article "Railway," vol. 17, page 309, may be found the following passage:—"Regarding the size of waggon wheels and their connection with the axles, various opinions exist. Some have the wheels fixed *dead* upon the axles, like the ancient cars, or those still in use in the Irish cart; others have both wheels and axles fitted for rotary motion; but the more general, and we would say the preferable mode, is to have the axles fixed and the wheels revolving."

The above references show that both methods of running the wheels were well known, and that they were considered to be mechanical equivalents of each other, prior to 1830.

35. *Ans. to 35th Int.* In answer to the 35th interrogatory I reply, that no change in the mechanical principles or modes of operation in the said Quincy car, can result from the substitution of axles revolving with the wheels in the place of axletrees. These two methods of arranging the running gear of railroad cars were known and recognized as mechanical equivalents of each other, many years previous to 1830, and I can see no reason why they should not be considered as such at the present time.

Tredgold, in 1824, says, page 103—"If the road be straight it is no matter whether the axles revolve or not." And Dr. Young, in his Natural Philosophy, vol. 1, page 217, quoted by Tredgold, page 104, says:—"Whenever the motion deviates from a straight line, the wheels that are fixed to a single axis must one of them be dragged forwards and the other pushed backwards; therefore *we prefer making the wheels revolve on fixed axles,*" &c.

In the Edinburgh Encyclopedia, Vol. 17, page 309, published in 1830, and republished in this country in 1832, under the article "Railway," are the following remarks: "Regarding the size of waggon wheels and their connection with the axles, various opinions exist. Some have their wheels fixed *dead* upon the axles, like the ancient cars, or like those still in use in the Irish cart. Others have both wheels and axles fitted for rotary motion. But the more general, and we should say preferable mode is to have the axle fixed and the wheel revolving."

These quotations which might be multiplied by reference to other works upon railroad engineering, are sufficient to show that the two methods of permitting the wheels to revolve on fixed axletrees, or of securing them to revolving axles, were known and recognized as mechanical equivalents of each other, long previous to 1830. Certainly so far as regards the arranging of the wheels, and their connection with each other, and with the body of a railroad car; in other words, so far as relates to all that is claimed in Winans's patent, such substitution involves no change in mechanical principle or operation, although each



mode has advantages peculiar to itself, and under certain circumstances should receive the preference over the other.

Neither could the mechanical principles or modes of operation be changed by enlarging the wheels; for wheels of every variety of size, from mere rollers up to wheels of five feet in diameter, had been in common use prior to the building of the Quincy car, both small and large wheels having their respective advantages and disadvantages; Large wheels, it is known, run easier than small ones. This is demonstrated in Tredgold, pp. 43, 44, 45, 46 and 47; while on the other hand, small wheels are lighter, cheaper, and stronger.

In Tredgold, pp. 48 to 56, are given the results of a great variety of experiments with different sized wheels. Those used in these experiments were four inches and eight inches in diameter. In the same work wheels of a great variety of size are spoken of as in use.

On page 13, wheels three feet two inches in diameter are mentioned; on pages 16 and 100, others of thirty-two inches diameter are instanced; on pages 25 and 99, wheels of fourteen inches diameter; page 36, thirty inches; and on page 95, wheels of four feet six inches, and five feet, are mentioned.

From the above quotation from the Edinburgh Encyclopedia, it appears that regarding the "size of the wheels" various opinions exist.

If it were maintained that any change of mechanical principle was involved in the increase of the diameter of the wheels, the question might be asked where this change of principle commenced, and where it ended. That cannot be an invention which is incapable of being defined by limits, but which is embodied in such expressions as "a little more," or "a little less," or "a little longer," or "a great deal longer." No new mechanical principle can then be involved in a change of the size of the wheels from large to small, or from small to large; the object of them all is the same, that is, to reduce the friction between the load and the rails. Large wheels may occasion less friction than small ones; but then the latter are lighter and safer, and cost less, and these are the considerations which guide the engineer in the choice of the size of his wheels, not any radical difference in their operation.

Neither can the method of draft, whether by the body or the truck, alter the principle of action of the car; each method has its advantages and disadvantages; each method was well known previous to 1829. Most if not all the cars represented in the treatises of Wood, Tredgold, and Strickland, being four-wheel cars, were drawn by the body, as was also the eight-wheel double-truck car of Chapman, in 1812. There is a single instance in Wood's treatise, of a locomotive having eight-wheels, which draws by the truck. I am not aware, however, that these are swiveling trucks, like those in use at the present day. For single cars it is considered preferable by some to draw by the truck. When the cars are united into trains, as I am informed, the method of draft from the king-bolt or from a part of the body adjacent to the king-bolt, to which spring draw couplings are attached, is preferred; though there is still great diversity of opinion upon this subject, for on some of the best conducted roads in the country the draft by the truck is still preferred. I am informed that many of the passenger cars of the Providence Railroad are still so drawn, and also that the same mode of draft has been in use for some years upon the

Maine Railroad. On the Eastern Railroad the draft is, so far as I have observed, from the king-bolt, the operation of which is different from that of a draft either by the truck or by the body.

No change of the mechanical principle of its operation could result from an increase of the length of the car, any more than there could in a steam engine or locomotive, when the size of these machines is increased. In each case the machines would be capable of doing a great amount of work, and the strength of the parts must undergo a corresponding increase, but no change of principle could result. And even if such change of principle could result, it has already been effected by Tredgold, who has given a drawing of an eight-wheel double-truck railroad car, in which the body is double the length of the ordinary four-wheel car; which increase of the length of the car, was the object he had in view when he proposed the eight-wheel double-truck arrangement; for in the paragraph immediately preceding, he says, page 94, "Small carriages must obviously be both heavier and more expensive, in proportion, than larger ones. *But as the stress on a wheel must be limited on a railroad, we cannot much enlarge the carriages without adding to the number of wheels.*"

Neither could the imposition of a box or car body upon the platform introduce or even require any modification of principle in the running gear of the said Quincy car, as it would matter not whether the load were stone or other freight or passengers. In either case the body would require to be suited to the nature of the load it was called upon to transport, but the arrangement of the running gear need not be disturbed or altered.

No change of the mechanical principles of the car would be involved in an increase of the speed at which the car was caused to run; the very object of the double-truck eight-wheel arrangement is to enable the trucks to conform to the curves of the track, and thus be capable of attaining an increase of speed. And there would be, in my opinion, no invention required to make any or all these changes. With regard to the securing of the wheels to their axles, or allowing them to revolve freely upon fixed axletrees, it has been shown above, that both of these methods were well known, and in public use many years prior to 1829; and therefore the substitution of one well known method for its acknowledged equivalent neither required nor involved invention. With regard to the increase of the size of the wheels, it has been shown above that the greatest variety of size had been adopted previous to 1829, and there could be no invention required to choose one size over all others, but only a sufficiency of mechanical or scientific knowledge and judgment, to enable the engineer to suit his choice to the circumstances and requirements of the case.

Neither could it require invention to substitute a method of draft by the body for an equally well known method of draft by the truck or by the perch, both of these methods being well known as attached to eight-wheel cars, the former upon the Chapman carriage, and the latter upon the Quincy car.

Neither would it require invention to increase the length of the platform or body of the car. Double-truck eight-wheel cars, with long bodies (double the length of the ordinary four-wheel car were known to [?] prior to 1829) (Tredgold) and the increasing of the length of railroad

cars, and the means of so doing, had been discussed by Tredgold, in 1824, in immediate connection with his description of the eight-wheel cars. Indeed eight-wheel cars were proposed by him for the very purpose of enabling him to increase the length of the car (p. 94), and the reason given for the increase of the number of wheels is, that *there is a limit to the weight which could be put upon each wheel*; and therefore, if the length of the car, and, consequently, *its weight, be increased*, the number of wheels must also be increased. He then goes on to show, in the very next paragraph, how this increase of length may be effected by the use of double-truck eight-wheel cars, substantially similar to the Quincy car, and to those now generally in use in the United States. It is evident if the number of wheels be increased above four, while they run in boxes set rigidly in the body, as in the old four-wheel car, that they cannot have a uniform bearing upon the rails on a change of level; for at the commencement of a rise, while the rear pair are still upon the level track, the centre wheels will be raised from off the rails, and the whole weight of the car and its load will be borne by the forward and rear pair; and he therefore proposes, as a means of remedying this evil, to adopt the double-truck eight-wheel car, in order that the stress upon each wheel may be at all times unvarying or equal, when the axles of the two trucks are not in the same plane; that is to say, in order that the stress upon the centre wheels of the arrangement, at the instant when the car commences upon a rise, may be equal to what it was upon the level track; and the adoption of the car which he proposes, viz., the double-truck eight-wheel car, fully meets the difficulties in the way, and enables him to enlarge his car body as he at first proposed.

Having first stated the difficulties in the way of lengthening the car, he removes them by the adoption of the double-truck eight-wheel car, and he has actually given a drawing of a car having its body twice the usual length. No invention would have been required to put a box or car body upon the platform of the Quincy car, as this is done wherever a car body is placed upon a platform. Neither would invention be involved in the running of said Quincy car fast or slow. It had all the essentials which could enable it to run either as fast or as slow as required; and the rate of speed that could be attained was dependent, not upon the car, but upon the power that was applied to drive it.

36. *Ans. to 36th Int.* The distance of the flanges from each other is of itself entirely immaterial, so long as they be not made to approach so near to each other as to interfere, and so long as there be space enough between them to allow of the introduction of brakes between the wheels, where it is desired to place them in this position. The distance between the flanges may at any time be changed by altering the size of the wheels.

37. *Ans. to 37th Int.* It is; because upon this distance depends the capacity of the rails to guide the wheels, and the steadiness and safety of the trucks upon the track.

38. *Ans. to 38th Int.* The maintaining the axles of the wheels in each truck at a fixed and uniform distance from each other, is considered by engineers and car-builders as of the first importance to the safety of the car; and it is asserted by the most experienced of them



with whom I have conversed upon the subject, that a small deviation from parallelism of the axles will endanger the running of the cars from off the track.

39. *Ans. to 39th Int.* I do not know what particular fact is intended to be referred to in this question.

40. *Ans. to 40th Int.* The word theory would seem to be incorrectly applied to characterise Mr. Winans's speculations. In my opinion the hypothesis upon which he has based his method of constructing and arranging eight-wheel cars, is itself entirely without foundation in truth or fact.

The hypothesis assumes that the placing of the wheels of each truck so near to each other that their flanges nearly touch, and connecting them together by means of strong springs, in connection with the imposition of the load upon the centre of the bolsters, "affords increased safety to passengers, not only from the diminished liability to breakage or derangement in the frame work, but also from the less disastrous consequences to be apprehended from the breakage of a wheel, axle, or other part of the running gear." I have already given it as my opinion that none of these consequences, but, on the contrary, increased danger and liability to breakage, must inevitably follow from the use of the truck which Winans describes.

And in answer to cross-interrogatories proposed by the counsel for the Complainant:

[Cross-Interrogatories, page 654.]

1 X. *Ans. to 1st Cross.* This question has been fully answered by me, in my reply to the second direct interrogatory.

2 X. *Ans. to 2d Cross.* This question was fully answered in reply to second interrogatory direct. It may not be out of place to remark, in this connection, that having translated from the German, for publication, the volume *Technology of the Iconographic Encyclopedia*, which goes quite fully into the subject of railways, I am somewhat familiar with the continental as well as the English and American roads and carriages.

3 X. *Ans. to 3d Cross.* I have never been examined as expert in open court, though my deposition has been taken several times to be used in cases of equity. Owing to the peculiar position in which the examiners of the Patent Office are placed, as regards the public and inventors and patentees, they have always avoided, by every means in their power, being called upon to give testimony in patent suits.

4 X. *Ans. to 4th Cross.* I have been exclusively so employed for several years last past, and upon subjects connected with that of the present inquiry, as more fully stated in reply to No. 2, direct.

5 X. *Ans. to 5th Cross.* It has not.

6 X. *Ans. to 6th Cross.* I consider that I understand the principles involved in the construction and operation of railroad cars, and that I have such knowledge of the subject as will enable me to compare the different constructions under the conditions mentioned in this interrogatory.

7 X. *Ans. to 7th Cross.* In my opinion it is important and essential



that there should at all times be the least practicable friction between the flanges and the rails.

8 X. *Ans. to 8th Cross.* This is far from being the case, and in a great majority of instances the contrary will be true. By far the greatest part of the friction between the flanges of the wheels and the rails, is produced by causes entirely independent of the resistance offered by the wheels to the guidance of the rails. Some of these causes may be enumerated as follows :

1st, Upon the curved portions of the track, the centrifugal force of the car tends to carry the whole structure in a tangent off the track, and thus the flanges of all the wheels are made to bear against the outer rail. In order to diminish the friction thus produced, the rail is raised a certain amount above the inner rail, for the purpose of counteracting this tendency. It is evident that the difference of level between the rails must correspond with a certain given velocity of the cars ; and it follows, that when the latter are moving at a rate exceeding this velocity, the flanges of all the wheels will be carried over against the outer rail, and when the rate of the motion is below this velocity, the cars will tend toward the inner rail, and thus the flanges of the wheels will bear against this rail—in either case producing friction between the flanges of the wheels and the rails, entirely independent of any resistance which the wheels may offer to the guidance of the rails. This species of friction exists to so great an extent, that when the outer rail has been raised considerably above the inner one, for the accommodation of passenger trains running at high velocities, the wheels of the slow moving freight trains have so ground upon the inner rail as soon to cut them up.

2d. Whenever upon the track, from any cause whatever, one rail is lower than the other, the car will tend towards the lower rail, and there will be much friction between the flanges and the rails, not produced by the effort of the rails to guide the wheels. This difference of level between the rails occurs particularly at points where the road is embanked upon a hillside, or wherever there is a greater depth of embanked earth under one rail than there is under the other.

3d. Upon all the minor sinkages and unevennesses of the track which abound upon every railroad, particularly where the rails have been laid for a considerable length of time, and upon all roads in northern climates during the winter and spring, the substructure being liable to constant motion from the effects of frost, the cars are surged from one side of the track to the other, and the flanges of the wheels are every instant brought in contact with the rails, and constant friction is produced between the two, which has nothing to do with the resistance which the wheels offer to the guidance of the rails.

4th. Upon both straight track and curve, when the wind is upon either side of the cars, its whole force tends to carry them over to one side, and friction is thus produced by this cause, between the flanges and the rails, which is independent of the effort of the rail to guide the wheels. This is by no means an insignificant cause of friction, a side wind being considered a far greater hindrance than a head wind, as it forces the flanges of all the leeward wheels to grind upon the rails. These are some of the constantly operating causes of friction between the flanges and the rails, which are entirely unconnected with the re-

sistance which the wheels offer to the guidance of the rails. The friction between the flanges and the rails will not therefore be "proportionate to the resistance which the wheels offer to the guidance of the rails."

For much stronger reasons, however, than those given above, this never can be the case. The interrogatory appears to be based upon the assumption that there is a constant effort on the part of the rails to guide the wheels while passing round curves; or in other words, that the wheel constantly depends upon the rail, not only to keep it upon the track, but also to force it round each successive instant, and counteract, by swiveling the trucks, any tendency which there may be to proceed in a straight line, and that thus if the truck be allowed to swivel easily, and without interruption, much less friction will be produced between the flanges and the rail.

Both the premises and the conclusion are without foundation in fact or in truth, and appear to be based upon the erroneous opinion entertained by some, that there is a constant effort on the part of the rail to swivel the truck while passing round a curve, and that thus the flange of the outer wheel is made to grind against the outer rail. This will undoubtedly take place, in a greater or less degree, if the wheels of the truck be placed near together, and the load be placed upon the centre of the bolster, to facilitate the swiveling of the truck; for taking the truck at the instant that it enters a curve, the first contact between the flange of the outer wheel and the rail swivels it upon the track. On account of the nearness of the axles of the wheels, and the consequent obtuseness of the angle formed by the diagonal of the truck and the rail, the force so applied to turn the truck will act at a very disadvantageous leverage, and thus great friction will be produced between the flange and the rail. This will occur not only upon the curved portion of the track, but whenever the rail comes in contact with the flange of the wheel, in the effort to guide it, and must be the invariable consequence of placing the wheels near together in the truck; and this species of friction will increase rapidly as the wheels of the truck are made to approach each other.

If, in addition to the nearness of the wheels, the trucks be allowed to swivel unlimitedly, as will be the case when no side bearings or other means are made use of to check the motion of the truck around its centre, the friction resulting from the nearness of the wheels is greatly multiplied; in such case, as the flange of the wheel impinges upon the rail, the truck being easily and freely turned, instantly yields, the opposite wheel being brought into contact with its rail; and thus the truck is caused to vibrate constantly from side to side, and a great amount of friction is thereby produced between the flange and the rails by the momentary concussions between them. This takes place both upon the straight and curved portions of the track.

Where the wheels are placed at greater distance apart in the truck, a much more acute angle is formed between the diagonal of the truck and the rail, and consequently the effort of the rail to guide the wheel is productive of much less friction between the rail and flange; in other words, the force expended by the rail upon the wheel, acts at a much greater leverage, and the consequence of this increase of distance between the wheels of the truck, is a greatly diminished friction, at all times, between the flanges of the wheels and the rails.

If now, as is the case upon the Eastern Railroad and upon the roads generally throughout the United States, so far as my observation has extended, the swiveling of the trucks be controlled by the interposition of side bearings, or (friction produced in some other way) between them and the car body, when the trucks are once swiveled by the contact of the wheels with the rail, they will not be thrown over upon the opposite rail, but will be moved an amount just sufficient for the exigencies of the moment, and will be held by the friction of the side bearings in the position into which they are moved, and there will be comparatively no vibration or wobbling of the truck.

In such case, as before explained in my answer to one of the direct interrogatories, when a car first enters upon a curve its trucks are swiveled into a position necessary to enable it to traverse that curve, which position will not be altered until the straight track be again reached, or the radius of curvature be changed, and the flange of the forward outer wheel will not necessarily be again brought into contact with the rail till such change in the line take place, when the truck will be again turned just sufficient to accommodate it to the newly entered portion of the track, and thus the friction between the rails and the wheels will be much less than in the case where the trucks are left free to swivel.

So far then from the "friction between the flanges of the wheels and the rails being proportionate to the resistance which the wheels offer to the guidance of the rails," the reverse of this may be said to be true.

9 X. *Ans. to 9th Cross.* The contrary of this will undoubtedly be true, and for the reasons given in the foregoing answer to the eighth cross-interrogatory. As has before been stated, in my reply to the ninth direct interrogatory, erroneous opinions have been entertained with respect to the friction generated between the wheels and the rails while passing curves, both as regards its character and extent; and it has been proved, by carefully conducted experiments, that the fears which were entertained in the infancy of railroad engineering, of the resistance, friction, and danger resulting from the use of curves of short radius, were comparatively without foundation, as will be seen from the following quotation from (Williams's Iron Roads, page 106):—"When the railway system was first projected great apprehensions were entertained, not only of the resistance which might be produced by curves, but of the danger of passing over them with considerable speed; and standing orders were adopted in Parliament, which required that all curves having a less radius than a mile should be the subject of special inquiry. In the course of investigations made by Dr. Lardner, in 1838, he had occasion incidentally to observe the effect of curves upon the resistance; and he found it to be almost infinitely less than had been previously supposed. Curves having a radius of three quarters or even half a mile did not produce the slightest augmentation of resistance, at any speed which the trains attained; and from observations and experiments which have been made upon American railways, where curves of short radius are very common, there is little doubt but that the effect ascribed to them, both as to resistance and danger, has been greatly exaggerated."

The experiments upon the curves of the English railways, it should be borne in mind, were made with the four or six-wheel cars, having



the axles running in boxes connected with the body of the car, without any provision for lateral motion; and this one fact alone is sufficient to show the fallacy of the hypothesis, that the wheels of a four-wheel truck should be made to approximate each other as near as possible, for the purpose of reducing the friction between them and the rails. The passenger cars of the Great Western Road have been extended to an unusual length, enabling them to carry 72 passengers each; but the wheels of these cars have not the least capability of swiveling to accommodate themselves to the curves of the track, and still they are run at the rate of sixty-five to seventy-five miles an hour. (Williams's *Iron Roads*, page 247.) Each of these cars with six wheels is the entire equivalent, so far as the ability to pass round curves is concerned, of a railroad truck having the wheels many times farther distant than those of any four-wheel trucks now in use in this country, and the draft which is applied to these cars being attached directly to this frame or truck in which the wheels are set, is precisely the same as the draft of a double-truck railroad car when drawn by the truck. A train of cars upon an English railroad is therefore a series of trucks, in which the bearing points of the wheels are removed many times farther apart than they are in Winans's truck, or even in the largest truck at present in use in this country, the draft at the same time being applied to the truck or wheel-frame; and yet these cars, as seen by the above references, *run* at the rate of seventy-five miles an hour, and traverse curves without the slightest augmentation of resistance at any speed which the trains attained.

It cannot be said that the radius of the curves upon the English roads is so much longer than it is upon American roads as to cause this difference and to enable them to run with their wheels so far apart, in England, while they are required to be placed so near to each other in this country. The following quotation (*Iron Roads*, page 107) shows this not to be the case:

"Experience has, in many instances, led to the adoption of curves of much smaller dimension than were formerly allowed. On the Newcastle and Carlisle line there is a succession of curves, the radii of which are very small (528 feet), and though some of these are found on steep inclines, yet the line is worked with economy and safety. On the Manchester and Leeds Railway, are two curves of 220 yards radius, distant from any station, and in a gradient of one in eighty-two, over which the trains have run with security and speed for several years."

This is not invariably the case, however, as much of the ability to run such curves at high speeds undoubtedly depends upon the character of the engine and cars employed; and it is stated in the paragraph from which the above quotation is taken that upon another road (Lancashire and Yorkshire line) some of the curves of short radius have been enlarged.

10 X. *Ans. to 10th Cross.* The contrary will, without doubt, be the case, for the reasons given in the foregoing answer to the eighth cross-interrogatory. Unrestrained freedom [!] motion in the trucks, or, in other words, the ability to swivel laterally, without control, by causing the forward wheels of the trucks to strike the rails, first on one side, then on the other, is, in my opinion, productive of great friction as well as unsteadiness of motion and danger.



11 X. *Ans. to 11th Cross.* My business, for many years back, has rendered it necessary that I should acquaint myself with the past history of railroad engineering, as well prior as subsequent to 1830; and I have been obliged, in the performance of my duties at the Patent Office, to make constant comparisons between the present state of railroad engineering and that which existed prior to the date of Winans's patent.

The means which I have enjoyed have been furnished—1st, by my own private library; 2d, the library of the Patent Office, including the principal scientific journals of England and the Continent of Europe, and the best treatises published upon the subject in question, in English, German, and French; 3d, the records of the Patent Office, which afford a very complete history of the progress of invention in this country; 4th, constant contact with engineers and practical men, and particularly with inventors in this class of subjects.

12 X. *Ans. to 12th Cross.* It is at all times essential and important that railroad cars, whatever be the speed at which they are intended to run, should be made in such a manner as to insure the greatest steadiness of motion that can be attained without sacrificing other important requirements. With regard to the "steadiness of motion attained by the four-wheel cars," it is known that the long double-truck cars are peculiar to this country; and that in England and on the Continent of Europe the four-wheel cars are in general use; and yet it is acknowledged by every one that has ever travelled in the European and American cars, that the former run much steadier than those of this country, notwithstanding the fact that the rate of speed there attained is far above that of this country. This is so generally allowed to be the case, that it admits of no denial; and I therefore reply to this part of the interrogatory, that if it be "important and essential to the running of cars at high speed, such as have been practised since the time of said Winans's invention, that they should be made in such a manner as to ensure greater steadiness of motion than was attained by the four-wheel cars," it is far from being proved that this end was attained, by the introduction of the long eight-wheel cars, for, as before stated, they do not run near so steadily as the short four-wheel cars of Europe. The cars of this country have been stretched out to their present length, not because they run more steadily, but because sixty passengers can be carried cheaper in one long car than in three or four short ones. The Americans not objecting to travelling in crowds, these cars have been introduced into this country; in Europe, however, where the lines between the different classes of society are more distinctly drawn, they have thus far not been introduced, though, as before stated, the short four-wheel cars run more steadily than the long cars of this country.

With regard to the second part of this interrogatory, it is not my opinion "that making the car-body of great length as compared with the modes before practised, and supporting the same at or near its ends, are essential to the attainment of greater steadiness of motion at high velocities, than could be obtained by the four-wheel cars as formerly constructed."

For independently of the evidence afforded by the short European in comparison with the American long cars, length of car body cannot of itself conduce to steadiness of motion. There are a great variety of

circumstances which might be enumerated, and which do conduce thereto, but there is nothing in the physics of the case, or in the external evidence connected therewith, which renders it at all probable that length of body is one of these circumstances.

13 X. *Ans. to 13th Cross.* It is, in my opinion, essential that cars which are intended to be run in trains, should have the capacity to work with other cars in a train; otherwise the object for which they are contrived and constructed would not be attained.

14 X. *Ans. to 14th Cross.* There is no necessity whatever that there should be an equality in the freedom of motion allowed the different trucks of a train. On the one hand they should be capable of turning with sufficient ease to enable them to accommodate themselves to the curves of the track, and on the other hand there should not be sufficient freedom of motion to cause the trucks to wobble upon the track.

Between these extremes, I do not consider it to be either "essential or important to the proper working of the first car in the train, that while it is subjected to the whole draft of the train, its trucks shall have the same freedom of motion that any other truck in the train has."

Indeed it is positively impossible to make even an approach to equality in the freedom with which the different trucks of a train are permitted to swivel; for, where one car is loaded and another is not, there will be many times more pressure upon the side-bearings of the trucks of the loaded car, than upon those of a car which is light.

This difference of pressure upon the side-bearings of the different trucks of a train, may, and daily and constantly does, amount to several tons, without taking into consideration the differing lengths and weight of the cars which are coupled together; and as the freedom of motion of the trucks upon their centres is controlled and limited by the friction created upon the side-bearings, the one must vary with the other. This inequality in the freedom of motion, which is permitted to the different trucks of a train, is furthermore rendered ten fold more striking by the fact, that while the side-bearings of some of the cars are furnished with friction rollers, upon others they are entirely dispensed with. Here again the freedom of motion of the trucks in one case is controlled and limited by a force many times exceeding that which is exerted for the same purpose in the other. These facts show that any such equality of freedom is positively unimportant and unessential to the proper working of the first or any other car, and also that it is quite impossible to attain such end in eight-wheel cars, constructed as they are at present, even if it were desirable. As a further evidence that this inequality in the freedom of motion of the truck is neither considered to be important or essential, some roads use friction wheels upon the side-bearings of their cars, while others entirely dispense with them; it being found that the lateral motion of the truck is sufficiently controlled in the one case, and not dangerously or injuriously limited in the other.

15 X. *Ans. to 15th Cross.* It is not essential, in order to give sufficient freedom of motion to the trucks of all the cars in the train, that the draft should not be applied to nor act through them. The question has been for a long time mooted whether the draft by the truck or by the body be preferable, and is far from being decided at the present

time. Many of the first engineers are decidedly in favor of the draft by the truck. Upon one of the best regulated roads in the country, a large portion of the eight-wheel cars are drawn by the truck, and I understand that after long trials of the two methods, viz., draft by the body, and draft by the truck, the latter receives the preference upon this road. Upon the Eastern Railroad a third method of draft is employed, viz., by the king-bolt, the operation of which is different from either of the other two.

Being entirely satisfied that unlimited freedom of motion of the truck, or any approach to it, is highly disadvantageous and dangerous, for reasons before given, I am also of the opinion that of the three methods of draft above mentioned, that by the truck, when properly applied, is to be preferred, and for the reason that there is a constant force operating upon each of them, except the last truck of the last car, nearly in the line of travel, which greatly tends to limit their vibrating or wobbling on the truck.

The same steadiness of motion is undoubtedly imparted to the trucks, when thus coupled together, as is given to the cars, by being connected together in trains—the pull upon the front and rear of either the trucks or the cars, keeping them down upon the track. This may at any time be verified by noticing the particularly unsteady motion of the last car in the train, which having no rear pull to hold it in line upon the truck, vibrates from side to side, and up and down, in a far greater degree than any other car in the train. This is often illustrated when the train passes over an obstruction, which, though not sufficient to displace the engine or the balance of the train, throws off the last car. This is not of rare occurrence, and recently happened near Dayton, Ohio, to a passenger train on its way to Cincinnati. The engine and train passed safely over a cow upon the track, the last car only excepted, which was thrown off the rails over the embankment. The practical difference, so far as the motion of the trucks is concerned, between the draft by the body and the draft by the truck, is this, the control exercised over the lateral turning of the truck by the side bearings being thrown out of the question in either case: In the former, that is, when the car is drawn by an attachment to the middle of the body, the truck itself is propelled by the pin which passes down through its centre, and is thus left free to move upon this pin in obedience to any shocks and concussions that it may receive at the joinings of the rails or from the surging motion of the cars. When the draft by the truck is employed, the wheel-frame is drawn by an attachment to its front rail, and the vibrating, oscillatory motion which it had in the former case, is almost entirely done away with. The fact that the platform or body of the English car is at the same time the wheel-frame, is, in my opinion, one of the causes of their cars running so much more steadily than do the double-truck cars of this country. The former are, in reality, all drawn by the perch, or by the truck; they are in fact a succession of wheel-frames or trucks all linked together; and their steadiness of motion would certainly not be less, if, instead of each individual truck having its own car-body, each pair of such frames were to have a long car body attached to it by king-bolts, provided the draft were still applied to the truck. We should then have a long car body, supported by two trucks, the distance between the bearing points of the

wheels being greater than that anywhere employed at the present time; and such a train of cars would doubtless run with a steadiness of motion equal to that of the European trains, notwithstanding the great distance between the bearing points of the wheels, and the fact that the cars were drawn by the truck.

16 X. *Ans. to 16th Cross.* The specification states that the load is borne upon the centre of the bolster, also that "this bolster must be of sufficient strength to bear a load upon its centre of four or five tons."

This might be construed to mean either a "centre," strictly speaking, that is to say, a small "centre," or bearing point, in which case too much bearing surface is given to the car upon the bolster of the truck in the model; or, if the language of the patent was considered to be indifferent, and not to be taken strictly, and that it was intended that there should be a larger bearing surface in the centre of the truck for the car to rest upon than might at first be implied from the use of the word "centre," in its mathematical sense, then the model may be said to represent the extent of bearing surface intended to be described in the patent. It is evident, however, that a very limited bearing surface was intended, the idea of side bearings being entirely precluded by what follows. It is stated toward the close of the patent, that "the bearing of the load on the centre of the bolster, which also is the centre of each bearing carriage, likewise affords great relief from the shocks occasioned by the percussion of the wheels on protuberant parts of the rails or other objects, and from the vibration consequent upon the use of coned wheels; as the lateral and vertical movements of the body of the car resulting from the above causes are much diminished." This is evidently pointed to the absence of side bearings, and could only be the case where no side bearings were used, or where the extent of bearing surface was very limited. If compared with the drawing which accompanies Winans's patent, the bearing surface upon the model is much less than that represented.

I therefore reply to this interrogatory, that the bearing surface upon the model B is greater than what the specification calls for, and less than that shown by the drawing. This was one of the points upon which a difference has already been stated to exist between the specification and the drawing of the patent. There being an entire difference between the car described in the patent and that represented in the drawing, it was necessary in constructing a model to follow either the one or the other. This model is evidently intended to represent the car described in the specification, and not the one shown in the drawing. The two could not possibly have been represented in one model, as there is an entire contradiction and discrepancy between them.

17 X. *Ans. to 17th Cross.* The model "B" shows no method of attaching the draft. Neither is there any method described in the specification of the patent by which such draft might be applied.

There is a method of draft represented upon the drawing of the freight car, which accompanies the Plaintiff's patent, but it is not described in the patent or even mentioned. The model throughout was evidently built to show the method of construction set forth in the patent. As there is no method of draft described in the patent, any representation of such would seem to be out of place.



18 X. *Ans. to 18th Cross.* A particular form of spring is described, which the patentee considered preferable to the ordinary spring to each wheel. The *patent* does not state that this form of spring is *essential*, though it *recommends it*, as more simple, cheap, and convenient than any other arrangement.

19 X. *Ans. to 19th Cross.* Springs are not essential to the proper construction of an eight-wheel car, any more than of a four-wheel or a six-wheel car. They have always been considered as necessary to the comfort of the passenger in passenger cars, and to such have always been applied. Tredgold (1825), page 93, says, after speaking of the shocks to which carriages are exposed on railroads: "Carriages for passengers, and for various kinds of goods, must be provided with springs, to reduce the force of these shocks." Their value was, therefore, as well known and appreciated in the time of Tredgold, as they are at the present time. It is better for the cars and for the road, that all railroad carriages be furnished with springs. This does not apply peculiarly to eight-wheel cars, but equally to all cars constructed with four, six, or eight wheels.

20 X. *Ans. to 20th Cross.* The word car, which is used in America to designate a railroad carriage, is entirely unknown and unused in that sense in England; the word carriage being universally made use of for that purpose in that country. The structure described in the Chapman patent is therefore nowhere called a railroad car, but throughout the patent is designated as a "carriage," which in England conveys the same meaning as the word car in this country.

The Chapman carriage cannot with propriety be called an engine. It is spoken of, throughout the whole patent, as a carriage for containing the motive power. There is no connection between the machinery and any part of the running gear; and this motive power could at any time be taken off and any other load substituted in its place, without in the least affecting the principle of its construction, or the necessity of altering the running gear.

The patent contains a drawing of a railroad carriage, which is described in the following language: "Fig. VIII shows a carriage of six-wheels, for the engine, which may *rest equally* or nearly so, on each of its wheels, *and move freely round the curves*, or past the angles of a railway. 1, 1, the fore pair of wheels are, as usual on railways, fixed to the body of the carriage; 2, 2, and 3, 3, the other two pair, are fixed (on axles parallel to each other) to a *separate frame*, over which the body of the carriage *should be so poised as that two thirds of its weight should lie over the central point* of the four-wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two thirds weight of the carriage should rest on *conical wheels or rollers*, bearing upon the curved plates *c, c*, so as to *admit the ledges* of the wheels, or those of the way, to guide them on *its curves or past its angles*, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way similarly to the carriage of a coal waggon. And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute, in place of the axis 1, 1, a transom, such as described (laying the weight equally upon both), and then, similarly to two coal waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway."

The method of draft was distinctly and unequivocally from the middle of the end of the body. A platform similar to that of an ordinary eight-wheel car extended out in advance of the body of the carriage. Near the front end of this platform and down through the same there was a small opening made, through which the chain or rope was passed, by which the carriage was propelled.

This chain, which lay along the centre of the track and between the rails, passed up through the opening in the front of the platform and was wound upon a drum, which drum was so situated with regard to the opening in the platform that the whole power exerted to move the carriage was brought to bear against the advance end of the opening, in a manner precisely similar to that in which the draft is applied to the eight-wheel cars at present in use in this country, where they are not drawn by the truck or king-bolt. And it cannot make the slightest difference whether the power which propels the carriage be placed in either case within the carriage or without it, so long as the pull be in the same direction, and applied to the same part of the carriage.

The difference, or rather the similitude, between the draft, as applied to Chapman's carriage, and the draft by the middle of the end of the body, as applied to the cars at present in use, may be illustrated by supposing a boat with a rope attached to its bow, the other end of the rope being wound up on a windlass upon shore. This draft may be said to be applied directly to the bow, and to correspond with the draft by the middle of the end of the body, as now commonly applied to eight-wheel cars. If then one end of the rope be made fast upon the shore and the other end be passed through an opening in the bow, and thence to a windlass attached to the boat, immediately over the opening, and the rope be wound upon the windlass, the force which propels the boat will be applied to the bow as before, and the boat will be forced in the same direction as in the former case; and it will make no difference whether the rope be wound up on shore, or on the boat; in each case the force exerted upon the rope is expended upon the boat at one and the same point, and tends to move the boat in one and the same direction.

The same may be said of the draft applied to the Chapman carriage. The rope or chain by means of which the power was applied to move it, passed through a hole in the forward portion of the platform, up to the windlass, where it was wound up, and the propelling power was thus applied at the same point as it is in the cars as at present constructed.

21 X. *Ans. to 21st Cross.* There is neither description nor drawing of draw-link in the account of the Tredgold car. It would not, however, have operated without such an appendage; and it is, therefore, certain that some species of draw-link was intended to be applied to the car, or must be applied to it, before it could be made available upon a railroad. All the other cars shown in this work are four-wheel cars, and are drawn by an attachment to the middle of the end of the body, and as no new or different mode is mentioned, it is hardly to be supposed, if another mode of draft had been intended, that it would not have been pointed out.

22 X. *Ans. to 22d Cross.* According to my understanding of the Tredgold car, there is a "provision for enabling the truck or wheel-

frames of said car with eight wheels, to swivel laterally to conform to the curves of the road," embodied in the following language, page 94: "The body of the waggon rests on the wheel-frames at A A, and is connected to them by an axis on which the frames turn, when, from any inequality, *the axes of the wheels* are not in the *same plane*." I have already shown, in my answer to the 21st interrogatory direct, that the trucks cannot accommodate themselves to the inequalities which Tredgold describes, unless they be constructed with a vertical axis, on which they may turn laterally.

23 X. *Ans. to 23d Cross.* I have stated, in reply to the 27th direct interrogatory, that if Winans's patent be construed to cover the whole principle of construction of the eight-wheel double-truck car, then the whole of his invention is embraced in the Allen steam carriage; and that if it be construed to cover only the peculiar novelties which he has introduced into the construction of the four-wheel truck, and the imposition of the load upon the centre of the bolster without side bearings, then no part of his invention is embraced in the Allen steam carriage.

24 X. *Ans. to 24th Cross.* It does not appear to be yet satisfactorily determined in what Mr. Winans's invention consists; and it would seem proper that this point should be settled before this interrogatory can be answered. Until it be settled, the interrogatory can only be answered by first defining the extent of Winans's invention, as showed by his patent. I have stated, in my reply to the twenty-ninth interrogatory direct, that all that was material to the operation of the eight-wheel double-truck car, described by Winans, was embodied in the Quincy car; and that in certain respects which were not considered material, the Quincy car differed from the Winans patent.

25 X. *Ans. to 25th [?] Int.* The four-wheel passenger carriages of 1830, undoubtedly, "possessed all the requirements and characteristics of a railroad passenger car, to enable them to move safely and smoothly over the curves and irregularities of a railroad, as then and now constructed, at a rate of thirty miles an hour;" for those at present in use upon the English railroads are constructed upon precisely the same principle with those in use prior to 1830, so far as regards the running gear, and are run at a speed of seventy-five miles an hour and upwards, running more steadily and smoothly than the double-truck cars at present in use in this country.

In 1829 the contest for the prize offered by the Liverpool and Manchester Railroad came off, at which time the "Rocket," which was the successful competitor, actually made, during a portion of the trial, thirty miles an hour with its load. (Williams's Iron Roads, page 26.) George Stevenson, the maker of this engine, was immediately invested with the building of the motive power for this road; and it is known that great improvements were made in those engines which immediately followed the Rocket. In 1830, at the time of the formal opening of the road, the company owned at least eight of the improved engines, all made by Stevenson. And on this occasion thirty-three loaded passenger carriages took a large company of passengers over the road. These carriages, as before stated, were constructed upon the same principle, so far as regards the running gear, as those at present in use. And it should be remembered that this road was by no means the first road

for the carrying of passengers, in operation in England. In 1830 there were six passenger roads in operation besides a great number of roads used chiefly for the transportation of merchandize. It is known that at this time, September, 1830, this company possessed one locomotive that on its trial trip had made thirty miles an hour. That it possessed, *at least*, seven others, all of which were built by the maker of the first mentioned machine, upon which they were improvements. That it possessed, *at least*, thirty passenger cars, which were constructed upon the same general principle, so far as relates to the arrangement of the running gear, as those which now accomplish with ease and steadiness seventy-five miles per hour and upwards.

And it cannot be for a moment doubted, that a mechanic of ordinary skill, having the knowledge possessed by the world in 1829 and 1830, about the construction of cars, would have been able to construct such cars as are inquired about in this interrogatory; for they were actually constructed and in use.

With regard to these cars performing "the duties required of the ordinary eight-wheel car now in use," as stated in the latter part of this interrogatory, they performed all the duties ever performed by railroad cars, with ease and steadiness.

26 X. *Ans. to 26th Cross.* I consider them to be undoubtedly the same in principle, and, as I have already stated, in my reply to the thirty-fourth direct interrogatory, that they have long been known as the entire equivalents, the one of the other, each having its advantages and disadvantages, which guide the engineer in the choice of the method he was to select.

In each case the object of the wheels is the same, viz., to reduce the friction between the load and the road. In the one case the friction of the wheels upon their axes was between the wheel and the axletree; in the other case it was between the axletree and the boxes in which it run. There is the same amount of friction of each kind in both cases, and the same amount of relief afforded to the carriage from the friction which would otherwise exist between it and the road.

27 X. *Ans. to 27th Cross.* The draft of the Quincy car, as appears from the model, and as I am informed, was from the truck.

28 X. *Ans. to 28th Cross.* Each of these methods of draft has its advantages and disadvantages, but I am entirely of the opinion that for the purpose of keeping the truck steadily upon the track, and controlling its sidewise motion, the draft by the truck is much to be preferred. There are considerations independent of the intrinsic advantages of the draft itself, which have caused the draft of the body to be more generally employed, at the present time, than the draft by the truck. These are: The immediate proximity of the ends of the platform, renders it exceedingly convenient to apply the coupling at this point, at the same time that the connections required are simple, short and light, and consequently easily managed. On the other hand, the adjacent trucks of two contiguous cars are so remote from each other that any coupling between them must be heavy and difficult to manage, beside being out of the way, and not immediately under the inspection of those in charge of the train. These remarks do not apply to the method of draft from king-bolt to king-bolt, as the connections lying immediately beneath the platform of the truck are easily supported and reached, for the pur-



pose of coupling and uncoupling. Another reason why the draft by the body has been perpetuated in the eight-wheel cars, is, that it was the universal mode of draft upon the old four and six-wheel cars, and that it required a change or invention when the eight-wheel cars were introduced, to substitute the draft by the trucks for the well-known draft by the body.

29 X. *Ans. to 29th Cross.* All the cars inquired of in this interrogatory are four-wheel cars, and the wheels run in boxes attached to the body.

30 X. *Ans. to 30th Cross.* It has not. In the Chapman carriage, as I have already shown in my reply to the twentieth cross-interrogatory, the draft is unequivocally and undeniably by the body.

In the Tredgold carriage, although there is no drawing or description of any particular method of draft, as applied in this particular carriage, it is rendered highly probable that the draft by the body was intended to be applied to this carriage also; for the cars described in Tredgold's work being four-wheel cars, are necessarily drawn by the body, and there is no other method of draft shown in the work or hinted at. The draft in the Quincy car was by the truck.

31 X. *Ans. to 31st Cross.* They certainly would not have conveyed any such information. I have already stated my belief in the entire unsoundness of the hypothesis that "placing the wheels in the trucks very near together would reduce the friction between the flanges of the wheels and the rails over curves," and given my reasons for such belief, in my reply to the eighth cross-interrogatory, and also for my opinion that such disposition of of [?] the wheels in the truck would materially increase the friction between the flanges and the rails.

32 X. *Ans. to 32d Cross.* The said drawings and descriptions could never have taught a mechanic that such was the fact. I have already stated my disbelief in the truth of this hypothesis and given the reasons therefor, in my reply to direct interrogatory number eleven.

33 X. *Ans. to 33d Cross.* They would certainly have conveyed no such information. I have already stated, in my reply to the fifteenth cross-interrogatory, my entire unbelief in the hypothesis "that in order to move over the curves and irregularities of a railroad at a high velocity, with safety and stability of motion, and with the least practicable friction on the rail, that the trucks should have the greatest possible freedom to conform to the surface of the rails, and should not be constrained by the draft."

34 X. *Ans. to 34th Cross.* This interrogatory appears to be based upon the double assumption that the cars constructed in 1830 and prior thereto, were not capable of traveling at the high velocities practised since that date; and that the attainment of such velocities was due to the subsequent introduction of double truck eight-wheel cars; nothing, however, can be further from truth and fact.

Upon the first trial of George Stevenson's locomotive, the Rocket, in 1829, a speed of thirty miles per hour was attained, (Williams's Iron Roads, page 25) which is above the average velocity practised in this country at the present time.

Where higher velocities are habitually attained, as in England and on the continent of Europe, the old four-wheel car is still in use. It is undeniable, that by far a higher rate of speed is attained in those

countries, and upon those roads where the four and six-wheel cars (similar to those in use prior to 1830, so far as relates to the arrangement of the running gear) are in use. It is stated in "Williams's Iron Roads," page 247, that "The express trains on the *Great Western Road*, proceed, when in motion, at from sixty-five to seventy-five miles per hour."

This far surpasses any thing attempted in this country with the eight-wheel cars. I am not aware that any allusion is made in the descriptions referred to in this interrogatory, to the speed at which the cars were calculated to run. They were all of them constructed and arranged so as to enable them to run at high speeds, and, in my opinion, more safely and more steadily than the car described by Winans.

35 X. *Ans. to 35th Cross.* Doubtless the main objects to be gained by the increase of the number of the wheels, in any case, is to enable the carriage to sustain greater burthen, without overloading any of them. This was the ultimate object then as now of increasing the number of wheels. In order to accomplish this, it was necessary then, as it is now, that the capability of the car to conform to the curves and irregularities of the track should remain the same, or as nearly so as might be, as it was when four wheels were used.

This we find noticed in the description of all the cars above referred to. Chapman speaks of his car as being so arranged "that it may rest equably, and move freely round the curves or angles, either on six or eight-wheels." This is precisely the object for which the double-truck arrangement is used at the present day. Again, further on, Chapman says: "Fig. 8 shows a carriage of six wheels, for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway." And again Chapman says, when speaking of the side bearings: "The two thirds weight of the carriage should rest on conical wheels or rollers, bearing upon curved plates, *c, c*, so as to admit the ledges of the wheels or those of the way, to guide them on its curves and past its angles, by forcing the transom or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal waggon." Further on Chapman says, "The whole four pair of wheels will arrange themselves to the curves of the railway." It would be difficult to find more appropriate language in which to describe the capability which the eight-wheel car possesses, of accomodating itself to the curves of a railroad, than that used by Chapman, in his description of his carriage.

Substantially similar language is held by Tredgold, in his description of the eight-wheel double-truck car, except that he goes further, and says that his car will accommodate itself to any of the inequalities found upon railroads. He says, page 94, "the body is connected with the frames so as to allow the greatest possible change of level on the rails." Again Tredgold says, speaking of this same car, "The body of the waggon rests on the wheel-frames at *A, A*, and is connected to them by an axis on which the frames turn, when from any inequality the axes of the wheels are not in the same plane."

36 X. *Ans. to 36th Cross.* I have no knowledge upon the subject of the loads which the cars or carriages in question were employed to

carry, except that the Chapman carriage was described as a carriage for the motive power; and it is stated in the same patent that any motive power may be used.

Of the Quincy car I have never heard it stated further than that it was employed to carry stone. Each of these carriages was, however, as well adapted to carry loads that were divisible as those which were not. The particular load which they were at any time time [?] employed to transport, cannot affect the nature of the running gear, nor change the originality of inventorship, of a particular device or arrangement of wheels for a special purpose; that is, after one man had invented it for carrying an engine, another cannot invent it for carrying stone, or still another for the purpose of carrying passengers; at least the subsequent inventors cannot be considered as such in the eyes of the law, that is, "first and original" inventors.

37 X. *Ans. to 37th Cross.* I answer each branch of this interrogatory in the negative.

38 X. *Ans. to 38th Cross.* I am not connected in any way with any railroad company.

39 X. *Ans. to 39th Cross.* This question can only be answered with reference to the construction which may be put upon Ross Winans's patent. If it be decided that the patent is limited to the peculiar construction of the spring truck, which his patent sets forth, I am of opinion that it possesses sufficient originality to make it valid. If on the contrary it be decided that the patent covers the principle of the eight-wheel double-truck car, that is to say, arranging the wheels in separate trucks or frames, which are connected with the body by king-bolts, round which the trucks are allowed to turn to accommodate themselves to the curves and inequalities of the road, then, in my opinion, the patent is invalid, for want of novelty; for the same principle is found to have been carried out in the same manner before the date of his patent, in numerous instances:

By Chapman, in 1812.

By Tredgold, in 1825.

By the Allen engine.

By the Quincy car.

By the Fairlamb car.

And my opinion upon this point would not be changed if it were shown that one of the above was a carriage to carry the motive power, which motive power was simply imposed thereon and without connections with the running gear, as this would not affect, in the least, the principle upon which the running gear was arranged, the latter not requiring to be changed or modified in case the motive power, whatever it might be, was taken off and a car body placed in its stead. Nor would my opinion be different from that given above, if one of the above cars had been used only for carrying stone or other heavy loads, it being necessary only to substitute a suitable car for the stone car, and the vehicle would then convey passengers and be substantially similar to those in use at the present day, no modification of the running gear being necessary, and no invention required to make the change.

My opinion would also remain unchanged, if it were ascertained that in the account of one no mention were made of its having had springs;

particularly if, in the same book which contained the account of this car, it were stated that all cars for carrying passengers should be furnished with springs. Nor would my opinion be changed if the wheels of one of these cars, instead of being fixed *dead* to the axle, were permitted to run thereon, the axle being made fast to the carriage; for both these methods are known, and have been known for centuries, as the equivalent the one of the other, both having their advantages and disadvantages, and each chosen according to the circumstances and requirements of the particular case in hand, no invention being required to substitute the one for the other. Furthermore, I am of opinion that none of the above named differences can be taken into consideration, in the comparison between Winans's patent and the before mentioned structures, as not one of them in the least affects the arrangement of the running gear in swiveling trucks, which is the only point upon which the comparison is pretended to be made. I first examined Winans's patent several years ago, in the performance of my duties in the Patent Office, and my opinion upon the subject was formed subsequent to such examination. I do not now remember whether I ever conversed with any person upon the subject of the novelty and originality of Winans's alleged invention prior to making an examination of the letters patent.

40 X. *Ans. to 40th Cross.* I am not a member of any association of railroad superintendents.

41 X. *Ans. to 41st Cross.* I have neither seen nor had stated to me the substance of the foregoing interrogatories until they were communicated to me by the Commissioner.

And in answer to further interrogatories on the part of the Respondent:

[Further interrogatories, page 659.]

1 *Ad. Ans. to 1st Ad. Direct.* I have no information upon the subject.

2 *Ad. Ans. to 2d Ad. Direct.* It certainly could introduce no new mechanical principle or mode of operation into these carriages to substitute longer bodies in place of those described or shown, as I have already stated, in my answer to the                   interrogatory. The first time two four-wheel swiveling trucks were placed under a car body of any kind, a new principle was introduced; and the introduction of this new principle in the construction of cars gave them the capacity of indefinite extension within certain limits prescribed by other attendant circumstances. The change from a four-wheel car to a double-truck eight-wheel car, the body thus being supported at two points at or near the ends thereof, at once put an end to those vertical and lateral motions and vibrations of the body which resulted from the fact that the body rested upon four wheels, with the axes near to each other, and with no inconsiderable proportion of the body projecting beyond the axes of the wheels. This allowed the car to have a rocking or see-saw motion, somewhat in the manner of a balance upon its fulcrum, while the eight-wheel car, being supported at both ends, was incapable of such motion, either lateral or vertical.

The principle itself should not, therefore, be confounded with one of the capabilities which resulted from its introduction. Were this distinction not recognized, Chapman, or Tredgold, or Allen, or Bryant, might



all be limited, in the use of the cars which they have described or built, to the exact length which they at first proposed; and if this were so with regard to the question of length, equally it would hold of any other dimension, width, height, &c., or of any other question which was one of degree only.

3 *Ad. Ans. to 3d Ad. Direct.* No such mere change of the proportions can be said to require invention; all that could result from such increase of length was as well known in Tredgold's time as now; indeed Tredgold, as before stated, proposed the use of two trucks, that he might increase the length of the car body, and still run upon any of the inequalities of railroads. In making these suggestions he did not limit himself to any particular length of body, neither were there any circumstances in the case, or in the nature of the change which he proposed, that could render it better adapted to one length of car body than another.

4 *Ad. Ans. to 4th Ad. Direct.* There is nothing in the descriptions and drawing of Tredgold's car, nor in the exigencies of railroads or railroad cars, which renders it essential that all the wheels should be equidistant from each other; neither is there anything in Tredgold's work upon railroads which contains the description and drawing of this car, so far as I can judge, which at all favors this idea. Neither if the two trucks were placed remotely from each other under one body, by the substitution of a longer body, is there anything in such remoteness of the trucks from each other, inconsistent or incompatible with the said description or drawings, or with the objects and purposes set forth by said Tredgold in his said treatise. On the contrary, the object which he does set forth was the increase of the length of the car; and this he proposes to accomplish by using two four-wheel trucks, that should turn on an axis to accommodate them to the inequalities of the road.

5. *Ad. Ans. to 5th Ad. Direct.* There is nothing in the description and drawings of the Chapman car that at all favors the idea that the wheels should be equidistant from each other. It is proper, upon all roads, that there should be but one wheel between a single pair of sleepers; but it matters not, so long as they are so far apart, that two wheels can never be between the same pair of sleepers, whether the wheels are five feet apart or fifty. The reason why two wheels should not be allowed to rest upon the rail between the same pair of sleepers is this: There is a limit to the weight which can safely be put upon a railroad wheel of a certain construction and size. Suppose that to be two tons; and suppose the rails to be of such a size, and to be supported by sleepers at such distances apart, that a section of rail between a single pair of sleepers could safely be loaded with a weight of two tons; now it is evident that the wheels must be placed at least as far apart as the distance between the sleepers, otherwise there would be two wheels upon the same section of rail at the same time, by which the rails would be overburthened; for the purposes of economy, therefore, the strength of the rails is made to correspond with the weight they are required to sustain; and if the rail be light and the sleepers far apart, a great weight cannot be put upon a single wheel without injury to the rails; and when it is desired to increase the weight of the car, an additional number of wheels must be used, for the double reason that neither the wheels nor the rails should be overloaded. This was un-

derstood and recognized by both Tredgold and Chapman. Tredgold says, page 126, "The distance between the wheels of the carriages should be such that the unsupported part of a rail should have to carry only one wheel." Also, page 26, he says, "So that the stress of each wheel on the rails of a railroad may be equal."

Chapman, as his carriage would be too heavy for the existing rails of [?] resting on four wheels only, constructs it with six or eight wheels. There is, however, nowhere in the description of the Chapman carriage any hint as to the necessity of having the wheels of his car equidistant from each other; and I cannot conceive of anything in the nature of the case, which could give rise to such a necessity, in the Tredgold, Chapman, or any other carriage. Neither is there anything in the remoteness of the trucks, supposing them to be placed remotely from each other, at all inconsistent or incompatible with the description or drawings of the Chapman carriage.

The object in each case was to enlarge the carriage. To enable this to be done the trucks were made use of; and they might be placed as far from each other beneath the car body as the strength of the framing would admit. Spreading them apart was only carrying out the original intention in each case.

6 *Ad. Ans. to 6th Ad. Direct.* There is, in my opinion, nothing which can possibly render it essential or desirable, that the wheels of the Allen steam carriage should be equidistant from each other, or that any particular distance should be preserved between them, except that they should not be so near to each other as to interfere, nor so far apart as to render the structure unstable or weak. Within these limits the trucks might be placed at any distance apart without doing violence to the principles upon which this carriage was constructed and operated, or without any inconsistency or incompatibility.

7 *Ad. Ans. to 7th Ad. Direct.* There is nothing in the Quincy car or in any of the before mentioned cars, which renders it essential that all the wheels should be equally distant from each other under one body. And touching the latter portion of the interrogatory, if the car body were lengthened it would require, as in any other analogous case, to be framed of proportionately stronger timber; but not the slightest difference can ensue in the action of the trucks. They will still accommodate themselves to the irregularities of the truck as before; and their construction need not in the least be varied, so long as they are made sufficiently strong to support the weight that may be put upon them; and I take it to be self evident that the swiveling truck would operate in a manner precisely similar, whether the car body were of the length of Chapmans', Tredgold's, Fairlamb's, Allen's, or any of those now generally in use. It is difficult to conceive that any invention is involved in the lengthening of the body, when every part connected with it operates in precisely the same manner as it did before the length was increased.

A change, therefore, "from a longer to a shorter body, so that the same trucks should be coupled by the body remotely from each other, while the body should be supported at or near the two ends," cannot be in anywise inconsistent or incompatible with the objects and purposes for which the Quincy car is designed and used.

8 *Ad. Ans. to 8th Ad. Direct.* The Chapman, Tredgold, Allen,

Winans, Fairlamb, and Quincy, and the cars now in general use, all have certain important characteristics in common with each other; they are all made to answer the same purpose in the transportation of freight or passengers; each of these cars has certain peculiarities of construction, though all founded, organized and embodied upon the same general theory, viz., the use of two trucks under one body. In tracing the differences between the special theory which distinguishes Winans's from the other cars above mentioned and from the cars in ordinary use, I do consider that theory essentially different from that of the cars in common use, and from all that I have before mentioned.

Winans's theory requires an extreme proximity of wheels, a peculiar construction of the truck, by long springs, and a bearing of the load upon the centre of the truck without side bearings; and neither of these peculiarities is found in the cars in common use.

9 *Ad. Ans. to 9th Ad. Direct.* It is not necessary, in order to carry out Mr. Winans's views, to employ bodies of great length, or of any particular length; for he says, in his preliminary reasoning upon the four-wheel car, "the greater the distance between the axles, *while the length of the body remains the same*, the less is the influence of these shocks or concussions," showing that it was not absolute distance of axle which he considered essential, but relative—and relative to the length of the car, be that what it might. It is rendered certain that this was what he intended, for he states that "the body of the passenger or other car I make of double the ordinary length of those which run on four wheels, and capable of carrying double their load." This of course he would do, as Tredgold had done before him, as the car had double the number of wheels to support it, and could therefore safely be made to bear double the load. That this was an essential element of his invention, or had anything material to do with it, he distinctly disclaims; and after speaking of the "relief from shocks and concussions, afforded by having the bolsters of the bearing carriages placed *under the extreme ends of the body*," he says, "this relief is not materially varied by increasing or decreasing the length of the body, while the extreme ends of it continue to rest on the bolster of the bearing cars," showing conclusively that it was not the length of the car which he considered material, but that it was, as he often states it, "placing the bearing carriages under the extreme ends of the body," or, as he before expressed it, the length of the body remaining the same.

I do not conceive that the idea of increasing the length of the car is any where stated in Winans's specification as having anything to do with his invention, but only as the number of the points of support were doubled the load might also be doubled. That this increase of length was material, however, he distinctly disclaims in the next paragraph.

10 *Ad. Ans. to 10th Ad. Direct.* I have already given my opinion that such "freedom of swiveling" is highly prejudicial, and have also given my reasons for such belief. With regard to the latter portion of the 33d cross-interrogatory, whether "the freedom to conform to the surface of the rails should not be constrained by the draft," there is an instance in which this "freedom" is entirely controled and limited by the draft. This is the case with the coupling for which letters patent of the United States were granted to L. D. Livermore, on the 11th



November, 1851, which is, without any doubt, the best mode of draft yet employed, and for the reason that it entirely does away with the freedom of motion of the truck inquired of in this interrogatory. This coupling is the first ever invented that was capable of entirely avoiding all friction between the flanges of the wheels and the rails, produced by the effort of the latter to guide the former. This capability it owes to the fact that the freedom of motion of the trucks is altogether done away with—they being positively guided, whether upon the straight track or curve, by the coupling bar, which entirely prevents them from swiveling, except as they may be guided and governed by the perch—the axes of the wheels always remaining parallel with the radius which passes through the centre of the truck when upon a curved track, and perpendicular to the line of the rails upon the straight track. Even the objections to the Winans's truck, so far as they arise from the nearness of the wheels to each other, are measurably done away with by the adoption of this coupling.—A certified copy of which, marked "Livermore's patent, B. F. Hallett, Commissioner," I desire to be annexed to this answer.

And in answer to additional cross-interrogatories:

[Further cross-interrogatories, page 660.]

1 *Ad. X. Ans. to 1st Ad. Cross.* I consider Winans's theory to be this: that the friction between the flanges and the rails is diminished by placing the wheels very near to each other, and by placing the burden upon the centre of the bearing truck, without side bearings; that the effect of concussions, both lateral and vertical, upon the cars, is diminished by placing the wheels beneath the extreme ends of the car; that by the use of a single spring to a pair of wheels, instead of the ordinary spring to each wheel, simplicity, cheapness, convenience, diminished liability to breakage, and additional safety are secured; and that by the use of the peculiar spring truck which he recommends, with the wheels very near to each other, the trucks being placed under the extreme end of the car, all the advantages resulting from the two extreme positions of the wheels, namely very near to each other and very far apart, together with those arising from the use of the elastic spring truck, would be realized.

2 *X Ad. Ans. to 2d Ad. Cross.* In 1829 the "Rocket" had attained a speed of thirty miles per hour. The maker of this engine immediately constructed a number of others for the Liverpool and Manchester Road, which are known to have been, all of them, superior to the "Rocket." And so early as September, 1830, we have an account of eight of these engines, with twenty-eight loaded passenger carriages, making the trip in company upon this road, from Liverpool to Manchester. These engines, as before stated, were all constructed by the builders of the "Rocket," which had already attained a speed of thirty miles per hour, upon its trial trip, and were larger and superior to it. I have not, however, the means of furnishing the *average* speed attained at this time.

Railroads then, as now, were used for the transportation of freight and passengers.

3 *X Ad. Ans. to 3d Ad. Cross.* Taking the Liverpool and Manches-



ter road, which was commenced in 1826 and completed in 1830, as an instance, it may safely be said that railroads were constructed, prior to 1830, in the most substantial and durable manner. *Few have ever been constructed to equal this one in this respect, the rails being laid upon heavy stone sleepers, the foundations for which were consolidated and compressed to a degree never attempted upon the roads of this country.* Upon this point I will quote from a recent author, "Our Iron Roads," p. 198: "Mr. Nicholas Wood mentions that when Mr. Stephenson was laying down the Liverpool and Manchester line, he adopted the plan of having the foundation in the first place so compressed and consolidated that the weight of the carriages should have no effect in causing the blocks to yield. This was done by the impact of the blocks themselves; the principle being to employ a force or weight upon the foundation on which they had to rest, that should be greater than the weight imposed by the action of the carriages on that foundation. To effect this, he made use of the block itself, by successively lifting it up, and allowing it to fall upon the seat upon which it was intended permanently to rest. The block was raised by every operation to such a height, that when let fall upon the foundation, the effect was much greater than the direct weight or pressure of the passing train."

With regard to the latter part of this interrogatory, whenever the weight to be put upon the rails becomes excessive, as is the case where the heavy locomotives of the present day are used, it is desirable to distribute the weight upon many points of support, rather than to concentrate it upon a few; as the more numerous are these points of support the lighter may be the rail; and the fewer these points of support, the heavier and more expensive it must be, and the greater will be the abrasion and wear upon it. But there was nothing in the materials or the method of construction employed in 1830, which rendered the distribution more desirable than [?] then than at the present time. The size and weight of the rails has been generally increased, for two principal reasons: 1st, because a heavy rail requires repairs and removals much less frequently than a light one; 2d, because of the immense weight of some of the locomotives now constructed; but without the least reference to the weight of the cars, which, in comparison with that of the locomotive, is altogether minor.

4 *X Ad. Ans. to 4th Ad. Cross.* There were six roads in operation, in England and Scotland, for the transportation of passengers, in 1830, viz:

1st. The Stockton and Darlington Road, opened in 1825.

2d. The Stratford and Moreton, opened in 1826.

3d. The Monkland and Kirkcaldock, opened in 1826.

4th. The Ballochney Railroad, opened in 1828.

5th. The Canterbury and Whitstable, opened in 1830.

6th. The Liverpool and Manchester Road, opened in 1830.

5 *X Ad. Ans. to 5th Ad. Cross.* Railways, in 1830, as at the present time, were used to transport passengers and merchandize, the cars being propelled either by locomotive or horse power. With a single exception locomotives were employed upon all the roads enumerated in the foregoing reply to the fourth additional interrogatory.

6 *X Ad. Ans. to 6th Ad. Cross.* I have already answered this question, in my reply to the second additional cross-interrogatory.

7 *X Ad. Ans. to 7th Ad. Cross.* I have never designed any such cars.  
SAM. COOPER.

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UNITED STATES OF AMERICA.

THE CIRCUIT COURT OF THE UNITED STATES WITHIN AND FOR THE MASSACHUSETTS DISTRICT.

MASSACHUSETTS DISTRICT, ss.

To John Hanan, of Baltimore, in the District of Maryland, Esq.

Know ye, that reposing confidence in your wisdom, prudence, and fidelity, we have appointed, and by these presents do authorise and empower you, to take the answers to the interrogatories hereunto annexed, of William S. Woodside, Louis M. Cole, James Menzies, Joshua I. Atkinson, Thomas McMechen, Philip E. Thomas, George Brown, and William Woodville, of Baltimore, witnesses to be examined on behalf of the Respondent, and to be used in a certain cause now pending in said Court, wherein Ross Winans is Plaintiff, v. The Eastern Railroad Company, Defendant.

And to this end, at certain days to be by you appointed for that purpose, to cause said witnesses, as aforesaid, to be brought before you, and each witness, while present before you, to examine carefully on oath touching the premises. And when you shall have taken the examination as aforesaid, to reduce or cause the same to be reduced to writing, and to be subscribed by each of said witnesses in your presence. And the same, so taken and subscribed, to return, together with this commission and your doings herein enclosed, sealed and directed to the Circuit Court aforesaid, as soon as the same shall have been executed.

In testimony whereof, we have caused the seal of the said Circuit Court to be hereunto affixed.

Witness, the Honorable Roger B. Taney, at Boston, this eighth day of October, in the year of our Lord one thousand eight hundred and fifty-three.  
H. W. FULLER, *Clerk.*

N. B. You shall not, except by consent of the parties in writing, permit either party to attend at the taking of the depositions, either himself, or by any attorney or agent, nor to communicate, by interrogatories or suggestions, with the deponents whilst giving their depositions, in answer to the interrogatories annexed to this commission. And you shall take such depositions in a place separate and apart from all other persons, and permit no person to be present during such examination, except the deponents and yourself, and such disinterested person (if any) as you may think fit to appoint as a clerk, to assist you in reducing the depositions to writing. And you shall put the several interrogatories and cross-interrogatories to the deponents in their order, and take the answer of the deponents to each, fully and clearly.

The execution of this commission appears by certain schedules hereto annexed.  
J. HANAN, *Com.*

CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

WINANS vs. EASTERN RAILROAD COMPANY.

*Interrogatories to William S. Woodside, Lewis M. Cole, James Menzies, on the part of the Respondents, de bene esse.*

1. What is your name, age, place of residence and business; and in whose employ are you now, and have you been, and for how long?
2. Are you acquainted with Conduce Gatch, of Baltimore, and how long have you known him, and what have you known of his place of residence, business, and standing?
3. What do you know, if anything, of his general character for truth or veracity?

WILLIAM WHITING, *Respondent's Solicitor.*

Complainant does not cross-examine. C. P. CURTIS, JR.

CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF MASSACHUSETTS.

WINANS vs. EASTERN RAILROAD COMPANY.

*Interrogatories proposed by the Respondent, to Joshua I. Atkinson, of Baltimore.*

1. What is your name, age, place of business, and office, as connected with the Baltimore and Ohio Railroad?
2. Whether or not, at any time, and if so when, did Ross Winans, the Complainant in this suit, obtain from the office of the Baltimore and Ohio Railroad any original papers belonging to said office; and whether or not did he give any receipt therefor? if yea, will you please to annex to your answer said receipt, or a copy thereof?
3. Whether or not has Ross Winans returned these papers and all of them? if so, when were they so returned?
4. Whether or not have you been applied to several times, by William W. Hubbell, Esq., of Philadelphia, or counsel, for leave to examine said original papers, and whether they were in your office at the times said applications were made?
5. Whether or not have you informed said Winans, or his agents or attorneys, or either of them, that said Hubbell was desirous of seeing said papers, in order to ascertain what they contained?

WILLIAM WHITING, *Solicitor of Respondent.*

The Complainant objects to the above interrogatories, as impertinent, and declines cross-examination.

C. P. CURTIS, JR., *for Complainant.*

CIRCUIT COURT OF THE UNITED STATES.

DISTRICT OF THE [?] MASSACHUSETTS.

WINANS vs. EASTERN RAILROAD COMPANY.

*Interrogatories to be proposed on the part of the Respondent, to Thomas McMechen, of Baltimore.*

1. What is your name, age, place of residence, and business?
2. What, if any connection have you had with the Baltimore and Ohio Railroad? in what capacity, and at what time?
3. Will you describe any eight-wheel cars used at any time upon said road, when they were made, when used, how constructed, how they operated?
4. Will you state any circumstances that enable you to fix the dates when said cars were made and used, if there be any such circumstances known to you?
5. Who was the inventor of said eight-wheel car?
6. Whether or not did it differ in principle from the eight-wheel car now in common use, so far as regards the running gear and the connection of the trucks with the body?

WILLIAM WHITING, *Sol'r of Defts.*

*Cross-interrogatories on behalf of the Complainant.*

1. Were not the trucks of the eight-wheel cars, referred to in your answer to the third interrogatory, similar in all respects to the four-wheel platform cars in use in said road? If not, state all the differences particularly.
2. Were not the trucks of the said eight-wheel cars connected by a strip of board, fitted to the draw-pins, on the inner ends, or to the inner ends of each four-wheel car?
3. Was not the draft applied to the truck in said eight-wheel cars?
4. Were the said eight-wheel cars used as eight-wheel cars exclusively, or were the trucks used separately for other purposes, as occasion required?
5. State your means of knowing who invented the eight-wheel car now in common use, and state what you mean by inventing the said cars.
6. What do (you) consider to be the "principle" of the eight-wheel car now used?
7. What do you understand by the principle of eight-wheel cars, "so far as regards the running gear and the connection of the trucks with the body?"
8. Have you seen, heard, or had stated to you, the substance of the foregoing interrogatories, or any of them, before your present examination? If so, by whom?

C. P. CURTIS, JR., *Compl'ts Solicitor.*



## CIRCUIT COURT OF THE UNITED STATES

FOR DISTRICT OF MASSACHUSETTS.

ROSS WINANS *vs.* EASTERN RAILROAD COMPANY.

*Interrogatories on behalf of Defendant, to Joshua I. Atkinson and Philip E. Thomas, George Brown, and William Woodville, Baltimore.*

1. Please state your name, age, place of business; and when and during what length of time and in what capacity or office have you been connected with the Baltimore and Ohio Railroad Company?

2. Are you acquainted with Ross Winans, the Complainant in this suit, and with his handwriting or signature?

3. Will you state whether or not, if at any time, and if at any time, when, the said Baltimore and Ohio Railroad Company, or any officer, agent, or person connected therewith, made at any time any written contract between the said Ross Winans and the said Company, in or about the month of February, 1834, relating to any of said Winans's inventions, or alleged inventions, connected with railroads? if so, is any such contract or is any assignment made on or about the last aforementioned date, on file among the papers or records of the said company? if so, will you annex the original, or in case the original is not in your control, a true copy thereof to your answer?

4. Will you state whether the said Ross Winans did or did not, on or about the year 1830, or at any other time, and if so, when, make any agreement, in writing or verbally, whereby the said Baltimore and Ohio Railroad Company become entitled, by said Winans's consent, to the free and uninterrupted use of any and all the inventions and improvements of the said Winans, relating to the subject of railway cars then made or that might thereafter be made by him? if yea, will you state when was the last mentioned contract first made; whether in writing or verbally; and if in writing, will you annex the original, and if that is not within your control, a true copy thereof; and if verbal, will you state the terms thereof, as nearly as you can recollect them?

5. Whether or not was a certain eight-wheel railroad passenger car, called the Columbus, in use upon the Baltimore and Ohio Railroad, on or about the 4th of July, 1831, and thereafter, and were other eight-wheel double-truck railroad cars put in use upon said railroad, prior to the 1st of October, 1834.

6. Whether or not did said Ross Winans have knowledge that said eight-wheel cars were used by said railroad company, and whether or not was the said use without objection on the part of said Winans?

7. Whether or not was the salary, wages, or compensation received by the said Ross Winans, if any, from the said railroad company, in payment for the use of any inventions or improvements that the said Winans might have made or might make; or was any particular and special compensation paid therefor; and what was the amount of such salary, wages, or compensation?

8. What right, if any, had the Baltimore and Ohio Railroad Company to use any alleged improvements or inventions made or claimed to be made by said Ross Winans, previously to the 1st day of October,

1834. And if said right was by virtue of any arrangement, stipulation, or agreement, will you state what they were, if verbal; or annex the same, or a true copy thereof, if in writing; if you have not done so already in answer to some preceding interrogatory?

9. Do you know any fact or circumstance not already stated by you, tending to show that eight-wheel double-truck railroad cars were publicly used by the Baltimore and Ohio Railroad Company, prior to October 1, 1834, with the knowledge and consent of said Winans? if so please state the same fully.

WILLIAM WHITING, *Solicitor of Respondent.*

No cross-interrogatories filed. C. P. C., Jr.

## IN THE CIRCUIT COURT OF THE UNITED STATES

WITHIN AND FOR THE MASSACHUSETTS DISTRICT.

ROSS WINANS *vs.* THE EASTERN RAILROAD COMPANY.

By virtue of the annexed commission, issued out of the Circuit Court of the United States within and for the Massachusetts District, to me, John Hanan, directed, empowering me to examine evidences in the above titled cause, now pending in said Court, on behalf of the Respondent, I, John Hanan, the Commissioner therein named, did, on the third day of December, in the year of our Lord one thousand eight hundred and fifty-three, cause to be brought before me, James Menzies, who being duly sworn, answers to the interrogatories propounded to him on the part of Respondent, *de bene esse*, as follows:

## DEPOSITION OF JAMES MENZIES.

To the first interrogatory, answers:

1. My name is James Menzies; I am fifty-eight years old; my residence is in the city of Baltimore, in the State of Maryland, and has been since the year eighteen hundred and fifteen. I am chief clerk of the Transportation Department of the Baltimore and Ohio Railroad Company. I am now in the employ of said Baltimore and Ohio Railroad Company, and have been been [?] in their employ for the last six years.

To the second interrogatory, answers:

2. I am acquainted with Conduce Gatch, of Baltimore, and have known him from twelve to fifteen years. I know that he resides in Baltimore, and has his shop in Pratt Street, in said city. He is a man of respectability, and an honest, hard-working and upright man.

To the third interrogatory, answers:

3. That his general character for truth and veracity is undoubted.

JAMES MENZIES.

And on the same day appeared before me, Louis M. Cole, a witness on the part of the Respondent, who, being duly sworn, answers to the interrogatories propounded to him, as follows:

DEPOSITION OF LOUIS M. COLE.

To the first interrogatory, answers :

1. My name is Louis M. Cole ; I am thirty-seven years old ; my place of business and residence is Baltimore, in the State of Maryland ; I am now and have been since eighteen hundred and forty-three, in the employment of the Baltimore and Ohio Railroad Company.

To the second interrogatory, he answers :

2. I have known Conduce Gatch since eighteen hundred and thirty-seven ; his place of residence is in the city of Baltimore, and his place of business was in Pratt street, in said city.

To the third interrogatory, answers :

3. His general character for truth and veracity is as good as any man's in the State of Maryland.

LOUIS M. COLE.

And also on the same day I caused to be brought before me, William S. Woodside, a witness named on the part of the Respondent, who, being duly sworn, answers to the interrogatories propounded to him, as follows :

DEPOSITION OF WILLIAM S. WOODSIDE.

To the first interrogatory, he answers :

1. My name is William S. Woodside, and I will be fifty-four years old next February ; I reside in the city of Baltimore, in the State of Maryland ; I have been in the service of the Baltimore and Ohio Railroad Company since the year eighteen hundred and thirty, and am now pay master, and have been serving in that capacity since eighteen hundred and forty-nine.

To the second interrogatory, answers :

2. I have known Conduce Gatch, of Baltimore, upwards of fifteen years ; I know that he resided in the city of Baltimore, and when deponent first knew him, he was employed as a boss-carpenter in the shops of the Baltimore and Ohio Railroad Company, and he always bore a fair character.

To the third interrogatory, he answers :

3. His general character for truth and veracity is as good as any person's ; deponent never heard of its being doubted.

W. S. WOODSIDE.

And on the fifth day of December, in the year eighteen hundred and fifty-three, I caused to be brought before me, George Brown, a witness named on the part of the Respondent, who, being duly sworn, answers to the interrogatories propounded to him, as follows :

## DEPOSITION OF GEORGE BROWN.

To the first interrogatory, answers :

1. My name is George Brown ; I am now about sixty-six years old ; my place of business is in the city of Baltimore, in the state of Maryland. I was Treasurer of the Baltimore and Ohio Railroad Company, from the time the road commenced until eighteen hundred and thirty-four ; and afterwards, a good part of the time, a director, and am now a director in said railroad company.

To the second interrogatory, answers :

2. I am acquainted with Ross Winans, the Plaintiff in this cause. I know his signature very well, but can't say that I am well acquainted with his hand-writing.

To the third interrogatory, answers :

3. I do not know if at any time the Baltimore and Ohio Railroad Company, or any officer or person connected therewith, made any written contract with said Ross Winans, relating to any of said Winans's improvements or inventions. I was always under the impression, that whatever invention or improvement Winans made, whilst he was in the employ of said Baltimore and Ohio Railroad Company, that company was to have the benefit of.

To the fourth interrogatory, answers :

4. I do not know whether said Ross Winans did or did not, on or about the year eighteen hundred and thirty, make any agreement, in writing or verbally, whereby the said Baltimore and Ohio Railroad Company became entitled, by said Winans's consent, to the free and uninterrupted use of any and all the inventions and improvements of said Winans, relating to the subject of railroad cars then made or that might thereafter be made. But deponent's impression was, as before stated, that the Baltimore and Ohio Railroad Company was to have the use and benefit of his improvements and inventions.

To the 5th interrogatory, answers :

5. There was an eight-wheel passenger car, called the Columbus, in use upon the Baltimore and Ohio Railroad, about July, eighteen hundred and thirty-one ; and after the Columbus was put on the road, I think the railroad company built most of their cars eight-wheeled double-trucks ; but I can't say positively whether they were or were not in use prior to the first of October, eighteen hundred and thirty-four.

To the sixth interrogatory, answers :

6. That said Winans had knowledge that said eight-wheeled cars were used by said railroad company, and no objection was made to the use of them, by said Winans, as I know of.

To the seventh interrogatory, answers :

7. I do not know whether the salary, or wages, or compensation, received by said Ross Winans, from the said railroad company, was received in payment for the use of any invention or improvements that said Winans might have made or might make ; nor do I know if any particular compensation was paid therefor. I know he was paid a salary or wages, but I have no knowledge of his having ever received any addition to his salary or wages, for any inventions or improve-



ments he made; nor do I know the amount of his compensation or wages.

To the eighth-interrogatory, answers :

8. I do not know, of my own knowledge, what right the Baltimore and Ohio Railroad Company had, to use any alleged improvements, made or claimed to be made by said Winans, previous to October, eighteen hundred and thirty-four; except that he (Winans) being in the employ of the said railroad company, I presumed Mr. Winans considered that any improvements or inventions made by him should inure to the benefit of said railroad company, but without its prejudicing any right he might have to obtain a patent therefor, if he should think proper to apply for it. I am under the impression, as before stated, that while said Winans was in the employ of the company any improvement or inventions made by him, the company was to have the use and benefit of.

To the ninth-interrogatory, answers :

9. I think there were eight-wheeled double-truck railroad cars put together for the purpose of hauling timber, prior to October, eighteen hundred and thirty-four; and I presume with the knowledge and consent of said Winans.

G. BROWN.

And on Tuesday, the sixth day of December, in the year eighteen hundred and fifty-three, I caused to be brought before me, William Woodville, a witness named on the part of the Respondent, who being duly sworn, answers to the interrogatories propounded to him, on the part of Respondent, as follows :

#### DEPOSITION OF WILLIAM WOODVILLE.

To the first interrogatory, answers :

1. My name is William Woodville; I am now sixty-two years of age; my place of business is in the city of Baltimore, in the State of Maryland. I was connected with the Baltimore and Ohio Railroad Company; first as Auditor, then Superintendent of Transportation, and also Superintendent of Repairs. I was in the employ of said company a little over six years. I left the employ of said company in the year eighteen hundred and thirty-six.

To the second interrogatory, answers :

2. I am acquainted with Ross Winans, the Complainant in this suit, and with his hand-writing and signature.

To the third interrogatory, answers :

3. I believe there was a contract or agreement in writing, between the Baltimore and Ohio Railroad Company and said Winans, but it was earlier than eighteen hundred and thirty-four, I think, by which the said company was to have the use and benefit of all improvements or inventions connected with railroad cars then made, or that might thereafter be made. I don't know if said contract or agreement is on file among the papers or records of said company. I cannot produce the original or a copy, as I have now no connection with said company.

To the fourth interrogatory, answers :

4. I think it was about the year eighteen hundred and thirty that said agreement or contract was made, whereby the said company became

entitled, by said Winans's consent, to the free and uninterrupted use of any and all the inventions and improvements of said Winans, relating to the subject of railway cars, then made or that might thereafter be made by him. The contract or agreement was in writing. As I before stated, I have now no connection with said company, and therefore cannot produce the original or annex a copy thereof.

To the fifth interrogatory, answers :

5. There was an eight-wheeled passenger car, called the Columbus, in use upon the Baltimore and Ohio Railroad, about the fourth of July, eighteen hundred and thirty-one, and afterwards, and there were other eight-wheeled double-truck railroad cars put in use upon said railroad, prior to the first of October, eighteen hundred and thirty-four.

To the sixth interrogatory, answers :

6. Said Ross Winans had knowledge that said eight-wheeled cars were used by said Baltimore and Ohio Railroad Company, without any objection being made by him, to my knowledge.

To the seventh interrogatory, answers :

7. My impression is that said Winans was to receive fifteen hundred dollars per annum, for his services as an employe in said company, and the company was to have the use and benefit of any inventions or improvements he might have made or might make in railroad cars, without any additional compensation.

To the eighth interrogatory, answers :

8. I suppose the right the Baltimore and Ohio Railroad Company had, to use any improvements or inventions made or claimed to be made by said Winans, previous to October, eighteen hundred and thirty-four, was by virtue of the agreement or contract spoken of by me, in my answer to the third interrogatory.

To the ninth interrogatory, answers :

9. Eight-wheeled double-truck railroad cars were publicly used, by the Baltimore and Ohio Railroad Company, prior to October, eighteen hundred and thirty-four, with the knowledge and consent of said Winans.

WILLIAM WOODVILLE.

On Wednesday, the seventh day of December, 1853, I caused to be brought before me, Philip E. Thomas, a witness named on the part of the Respondent, who, being duly affirmed, answers to the interrogatories propounded to him, on the part of Respondent, as follows :

#### DEPOSITION OF PHILIP E. THOMAS.

To the first interrogatory, answers :

1. My name is Philip E. Thomas ; I am in my seventy-eighth year ; I reside in the city of Baltimore, in the State of Maryland ; at present I am not engaged in any business ; I was the President of the Baltimore and Ohio Railroad, from the year eighteen hundred and twenty-eight, to eighteen hundred and thirty-six, inclusive.

To the second interrogatory, answers :

2. I am acquainted with Ross Winans, the Complainant in this suit ; but I am not sufficiently acquainted with his hand-writing or signature, to be able to prove it.

To the third interrogatory, answers:

3. I know there was an agreement made by the Baltimore and Ohio Railroad Company with said Winans, but whether verbal or written I do not now recollect, by which the said railroad company was to have the use of any improvements or inventions connected with railroad cars then made or which might thereafter be made by said Winans, whilst he should remain in the employment of the said railroad company, and that that agreement was carried into effect by both the said company and Winans. I do not recollect precisely the year when said agreement was made, but believe it was somewhere about the year eighteen hundred and thirty—a little before or a little afterwards. I suppose if said agreement was in writing, it is on file among the papers and records of said company; but I having no longer any connection with said company, cannot produce it, but suppose a copy, if it exists, can be procured from the office of the said company.

To the fourth interrogatory, answers:

4. This I conceive fully answered by my reply to the preceding interrogatory.

To the fifth interrogatory, answers:

5. There was an eight-wheel passenger car, called the Columbus, placed on the said railroad as an experiment car. It was the first eight-wheel car placed on said road, and I believe it was the first that was put on any railroad. I do not recollect the precise time when the said car Columbus was put on said railroad; but it was found to answer the expectations of the inventor and the railroad company, and from that time the said company continued to have cars of that description made, until I retired from the presidency of said road.

To the sixth interrogatory, answers:

6. The said Ross Winans had knowledge that said eight-wheel cars were used by said railroad company, and the use was not objected to by said Winans.

To the seventh interrogatory, answers:

7. The said Ross Winans was taken into the service of the Baltimore and Ohio Railroad Company as a machinist, upon an annual salary, with the understanding that he was to have the right to use the company's road, for the purpose of testing any experiments he might make in the improvement of railroad machinery; and the railroad company was to have the use and benefit of any of his inventions or improvements, then made or thereafter to be made, without any additional compensation. I do not now recollect what was the amount of said annual salary.

To the eighth interrogatory, answers:

8. That the Baltimore and Ohio Railroad Company had the right to use the improvements or inventions made or claimed to be made by said Winans, by virtue of the agreement referred to in my answer to the third interrogatory.

To the ninth interrogatory, answers:

9. I know that eight-wheeled double-truck cars were used on the said railroad, from the time the Columbus was put upon it, which was previous to eighteen hundred and thirty-four, and it was with the knowledge and consent of said Winans.

P. E. THOMAS.

And on Thursday, the eighth day of December, in the year eighteen hundred and fifty three, I caused to be brought before me, Joshua I. Atkinson, a witness named on the part of Respondent, who being duly sworn, answers to the interrogatories specially propounded to him, on the part of the Respondents, as follows :

## DEPOSITION OF JOSHUA I. ATKINSON.

To the first interrogatory, answers :

1. My name is Joshua I. Atkinson ; I am now in my fifty-first year ; my place of business is in the city of Baltimore, in the State of Maryland ; and I am the Secretary and Treasurer of the Baltimore and Ohio Railroad Company.

To the second interrogatory, answers :

2. Said Ross Winans, the Complainant in this suit, did, on the 21st of September, 1852, obtain from the office of the Baltimore and Ohio Railroad Company, sundry original papers, receipts, and vouchers, belonging to said office, and gave a receipt therefor. A copy of said receipt is hereto annexed, marked " Exhibit No. 1."

To the third interrogatory, answers :

3. He has not returned these papers.

To the fourth interrogatory, answers :

4. Mr. William W. Hubbell did apply to me for leave to examine said original papers, but the papers were not in the office at the time he applied.

To the fifth interrogatory, answers :

5. I did inform said Winans that Mr. Hubbell was desirous of seeing said papers, and he replied he had no objections to his seeing them.

J. I. ATKINSON.

To the second series of interrogatories, propounded to him in connection with Philip E. Thomas, George Brown and William Woodville, of Baltimore, on the part of Respondent, he answers as follows :

To the first interrogatory, answers :

1. I refer to my answer to the first preceding interrogatory.

To the second interrogatory, answers :

2. I am acquainted with Ross Winans, the Complainant in this suit, and with his hand-writing and signature.

To the third interrogatory, answers :

3. There was a written contract made between Ross Winans and the Baltimore and Ohio Railroad Company, on the eleventh day of February, eighteen hundred and thirty-four, relating to said Winans's inventions, a copy of which I hereto annex, marked Exhibit No. 2.

To the fourth interrogatory, answers :

4. I was not in the employ of the Baltimore and Ohio Railroad Company, in eighteen hundred and thirty, and I know of no written or verbal agreement, except the written contract referred to in my answer to the preceding interrogatory, marked Exhibit No. 2.

To the fifth interrogatory, answers :

5. I have no knowledge.



To the sixth interrogatory, answers :

6. I have no knowledge.

To the seventh interrogatory, answers :

7. I refer to the written contract, a copy of which is annexed, marked Exhibit No. 2, which I think is a full answer to this interrogatory.

To the eighth interrogatory, answers :

8. The Baltimore and Ohio Railroad Company had a right to use any of the alleged improvements or inventions of said Winans, by virtue of the written agreement or contract, marked Exhibit No. 2, and referred to in my answer to the third interrogatory.

To the ninth interrogatory, answers :

9. I have no knowledge.

J. I. ATKINSON.

#### EXHIBIT No. 1,

*Referred to in Joshua I. Atkinson's Answer to the Second Interrogatory to him specially propounded on the part of Respondent.*

JOHN HANAN, Com'r.

BALTIMORE, Sept. 21, 1852.

Received this day, of J. I. Atkinson, Esq., Treasurer of the Baltimore and Ohio Railroad Company, sundry papers, receipts, and vouchers, relating to the acts and business of the said Company, from the year 1830 to 1835, inclusive ; which papers, receipts, vouchers, &c., I hereby bind myself to return to the custody of Mr. Atkinson, within sixty days from this date. The papers above-mentioned are numbered in *red ink*, from one to two hundred and forty-seven (1 to 247) inclusive, for the purpose of designating them and the whole number received as above.

[Signed]

ROSS WINANS.

#### EXHIBIT No. 2,

*Produced by Joshua I. Atkinson, and referred to in his Answer to the Third Interrogatory of the second series.*

J. HANAN, Com'r.

This instrument of writing, made this eleventh day of February, in the year of our Lord one thousand eight hundred and thirty-four, between Ross Winans, of the city of Baltimore, in the State of Maryland, of the first part, and the Baltimore and Ohio Railroad Company of the second part.

Whereas the said Ross Winans has heretofore made many inventions in railways and railway carriages, and the machinery connected therewith, and among the rest in the diminution of friction by the Winans friction wheel, secured to the said Winans, by letters patent of the United States, dated October the eleventh, in the year eighteen hundred and twenty-eight, and by the use of diminished outside steel journals, for the axles of the wheels of railway carriages, for which letters patent of the United States were obtained by said Winans, dated July the twentieth, in the year eighteen hundred and thirty-one; also an improvement in the mode of constructing the wheels of railway carriages, by combining wood therewith, also secured by letters patent of the United States, to the said Winans :

And whereas the said Winans has also made other inventions and

improvements in railways and railway carriages, and the machinery connected therewith, for which it is likewise his purpose and intention to obtain letters patent : and whereas the said Ross Winans has agreed with the said Baltimore and Ohio Railroad Company, to grant and sell to them the right and privilege to make or cause to be made and use, the said diminished outside steel journal, the wheel of combined wood and iron, and, so far as the right of the said Winans exists therein, the said friction wheel, and all other his said inventions now made and patentable, and all such inventions and improvements in railways and railway carriages and the machinery connected therewith, as the said Winans may hereafter make or patent, while he remains in the service of the said company as hereinafter mentioned, for and during the same terms or periods for which the said Winans might be entitled to enjoy the same, under any letters patent that he has obtained or may obtain therefor, upon any railroad constructed by the said company or upon any cars owned by them. In consideration whereof, the said company have agreed to pay to the said Winans the sum of five thousand dollars (\$5000), and to retain the said Winans in the service of the said company, to be engaged in the perfection and improvement of machinery and other objects similar to those to which the employment of the said Winans, before the date of these presents related, at a salary of fifteen hundred dollars per annum, with the privilege to the said Winans of rendering to other companies, as he has done before the date of these presents, similar services—so long as the improvement and perfection of such machinery or other objects as aforesaid may require attention in the business of the said company, and so long as he shall discharge his duty in these respects faithfully :

Now, therefore, this indenture of writing witnesseth, that for and in consideration of the sum of five thousand dollars, to the said Ross Winans in hand paid by the said company, at and before the sealing and delivering of these presents, the receipt whereof is hereby acknowledged, and for and in consideration of the other matters and things in the said herein before recited agreement set forth, the said Ross Winans hath granted, assigned, and set over, and by these presents doth grant, assign, and set over, to the said Baltimore and Ohio Railroad Company, the right and privilege to make or cause to be made and use, the said diminished outside steel journals, the combined wheel of wood and iron aforesaid, and, so far as the right of the said Winans exists therein, the said friction wheel, and all his, the said Winans's other inventions now made and patentable, and all such inventions and improvements as he, the said Winans, may make or patent while he remains in the service of the said company, as herein before mentioned, in railways and railway carriages and the machinery connected therewith, for and during the same terms or periods for which the said Winans might be entitled to enjoy the same under any letters patent that he has obtained or may obtain therefor, upon any railroad constructed by the said company or upon any cars owned by them. And the said Winans doth hereby further relinquish and release to the said company all claim which he, the said Winans, might or could have against the said company, for the use heretofore by them of any of his inventions and improvements, in railways and railway carriages and the machinery connected therewith.

In witness whereof, the said Ross Winans hath hereto set his hand and seal, on the day and year first above written.

[Signed,] ROSS WINANS. [Seal.]

Signed, sealed, and delivered, in the presence of us,

JAS. B. LATIMER.

WM. WARFIELD.

#### STATE OF MARYLAND.

Be it remembered that on this eleventh day of February, in the year eighteen hundred and thirty-four, before us, the subscribers, Justices of the Peace of the said State, in and for Baltimore City, personally appeared Ross Winans, to us personally known, and acknowledged the within instrument to be his act and deed.

Acknowledged before us,

JAS. B. LATIMER.

WM. WARFIELD.

I certify the foregoing to be a true copy from the minutes of the Board of Directors of the Baltimore and Ohio Railroad Company, on the 13th of February, 1834.

J. I. ATKINSON, *Secretary*.

And on the twenty-fourth of December, in the year eighteen hundred and fifty-three, I caused to be brought before me, Thomas McMechen, a witness named on the part of the Respondent, who being duly sworn, answers to the interrogatories propounded to him on the part of Respondent, and to the cross-interrogatories on the part of the Plaintiff, as follows :

#### DEPOSITION OF THOMAS McMECHEN.

To the first interrogatory, he answers :

1. My name is Thomas McMechen; I am now in my fifty-third year; I reside in the city of Baltimore, in the State of Maryland; my business is superintending the laying of rails on railroads.

To the second interrogatory, answers :

2. I was one of the contractors and superintendents of the Baltimore and Ohio Rail [?] in the years 1829 and 1830.

To the third interrogatory, answers :

3. While I was a contractor, in 1830, between the month of March and the month of May, in 1830, the long timbers called string-pieces, used in making the track, the pieces being six inches square, and from sixteen to forty eight feet in length, were hauled on the track nearest Baltimore, on eight-wheeled cars; and by means of these eight-wheeled cars they were delivered wherever required. One of these eight-wheel cars consisted of two four-wheel trucks, having regular truck-frames, holding the axles of the pairs of wheels parallel to each other. Deponent can't now say how far the wheels were apart; but they were checked by a brake. But whether this brake was similar to what is in use now on various roads, in eight-wheeled cars, I do not know. The frames of these trucks had stout cross-pieces for bolsters, and were planked over with the other part of the framing, holding the whole frame firmly together. On top of each of those four-wheeled trucks

was placed an [?] bolster, secured to the middle of the trucks by a bolt; and these two trucks, with their bolsters, were permanently fastened together, about twenty feet apart, by a long string-piece, six inches square, being one of the pieces the same as the rails were laid with. This piece of timber secured the trucks this distance apart by resting on the middle of the bolsters, and the centre pivot of the bolsters going down through a hole in each end of the timbers, and through the bolsters. Upon the top of the bolsters, also, of this eight-wheeled carriage, thus permanently connected, the long timbers or string-pieces were placed, and transported on the road wherever required; and on their removal from the car, the cars still remained as before, an organized body, and was drawn back for another load. This was the construction and operation of the eight-wheeled car that delivered the timber on the road along side of my contract.

To the fourth interrogatory, answers:

4. The car ran on a road that was laid in 1829, and on the track it was running or finishing out, and I saw the car daily.

I finished my contract in May, 1830; and after visiting Pottsville, Pennsylvania, I returned; and in July, 1830, for about three weeks, I superintended the laying of rails on the second division of the Baltimore and Ohio Railroad, beyond or west of Ellicott's mills; and after this, in August, 1830, I was attached to the engineer corps on the survey of the Baltimore and Susquehanna Railroad. I am certain that this eight-wheeled car, constructed and operated as I have described, was used during the latter part of April and fore part of May, in the year 1830, and persons used often ride on it when it was running on the road.

To the fifth interrogatory, answers:

5. I always understood and believed that Conduce Gatch invented and got up the eight-wheeled car.

To the sixth interrogatory, answers:

6. The trucks turned under the bolsters, to suit the curves and other inequalities of the road, and, in point of principle of construction and operation, my opinion is that it was the same, substantially, as the eight-wheeled platform freight and passenger cars then used on the various railroads.

To the cross-interrogatories on the part of the Plaintiff, answers as follows:

To the first cross-interrogatory, answers:

1 X. The trucks of the eight-wheeled cars, referred to in my answer to the third interrogatory, were similar in all respects to the four-wheel platform cars in use on said road.

To the second cross-interrogatory, answers:

2 X. The trucks of the said eight-wheel cars were connected by a common string piece at each end, with a bolt through the bolster, as particularly described in my answer to the third direct interrogatory.

To the third cross-interrogatory, answers:

3 X. It was.

To the fourth cross-interrogatory, answers:

4 X. They were used exclusively in forwarding the timber to the places where it was wanted. A four-wheeled car would not have answered the purpose.



To the fifth cross-interrogatory, answers :

5 X. That deponent saw Conduce Gatch fixing the bolsters on the trucks, and he (said Gatch) claimed to be the inventor.

To the sixth cross-interrogatory, answers :

6 X. I consider the principle of the eight-wheel cars now used, to be the connection by bolts.

To the seventh cross-interrogatory, answers :

7 X. I consider this as answered by my response to the preceding cross-interrogatory.

To the eighth cross-interrogatory, answers :

8 X. I have not seen, heard, or had stated to me, the substance of the foregoing interrogatories, or any of them, before my present examination.

THOMAS McMECHEN.

I, John Hanan, Commissioner named in the annexed commission, do hereby certify that, on the respective days herein mentioned, I examined William S. Woodside, Louis M. Cole, James Menzies, Joshua I. Atkinson, Philip E. Thomas, George Brown, William Woodville, and Thomas McMechen, witnesses named on the part of the Respondent in said cause. And I do further certify, that the said witnesses, being by me first carefully examined and cautioned, and duly sworn and affirmed, according to law, to testify the whole truth, were by me examined, separately and apart, and that no person was present at each of said examinations but witness and myself.

In testimony whereof I hereto set my hand and seal, this 24th day of December, in the year of our Lord one thousand eight hundred and fifty-three.

JOHN HANAN, *Commissioner*.



# RESPONDENT'S EXHIBITS.

## RESPONDENT'S EXHIBIT, No. 1.

### TWO AFFIDAVITS

*Of Oliver Byrne, (referred to in the Agreement of Counsel.)*

C. P. CURTIS, JR.

W. WHITING.

CIRCUIT COURT UNITED STATES—NORTHERN DISTRICT OF  
NEW YORK.

ROSS WINANS vs. ORSAMUS EATON, ET AL.

EASTERN DISTRICT OF PENNSYLVANIA, ss.

Oliver Byrne, being duly sworn according to law, says, I am forty-two years of age, and reside in the city of Philadelphia. I am a civil, military and mechanical engineer, have been professor of mathematics in the College of Civil Engineers, London, for four and a half years; author of the "Practical Model Calculator," "The Practical Metal-Workers' Assistant," "The Practical Cotton Spinner," published by H. C. Baird, of Philadelphia, "A Dictionary of Machines, Mechanics, Engine Work, and Engineering," a work of nearly 2,000 pages and upwards of 4,000 engravings, published by the Appletons, New York, "The Pocket Companion, for Machinists and Engineers," published by De Witt & Davenport, New York, and of many important works on engineering, mathematics and mechanics. I was the acting engineer of the Midland Grand Junction Railway, the North Metropolitan Junction, the Tring Cambridge, and New Market and other railways in England. I was the consulted engineer on the Dublin and Galway Railroad, the acting engineer on the Belfast and Galway Junction, and on other railways in Ireland and elsewhere. I was one of the consulted engineers on Menai Tubular Bridge, who confirmed the views of Robert Stephenson, the original designer. I have been all my life engaged in the application of the sciences to the arts, engineering, constructing railways, machines, and engine work. I understand the nature and construction of the eight-wheel cars used on the railways in the United States.

I saw eight-wheel cars on the railway that ran between Killineykillie and Dalkey, in Ireland, in the summer of the year 1831, in the month of August. They were used to carry freight; the coupling was at the middle of the end of the body; they had two four-wheel trucks, the wheels of each truck being a proper distance apart, suited to the curves, (about 20 inches); and the trucks connected by a long body, remote from each other. The body was connected to the centre of the trucks

by king-bolts or transom-bolts; the trucks yielded to the curves of the road. They were used for carrying stone and heavy materials.

The principle of construction of these two four-wheel trucks, connected by a long car body, was precisely the same as the eight-wheel passenger and freight cars now in use on the railroads of the United States. The eight-wheel car was called Chapman's car, as by connecting the Newcastle coal waggons together by a beam or frame, uniting the bodies, the trucks which sustained the body would conform to the curves of the road. Many of the Newcastle coal waggons had a body resting on a four-wheel truck, with a bolt in the centre, about which the body of the wagon moved as its centre, and they were drawn by the body.

Mr. Chapman, in his specification, published in 1814, in the 24th volume, second series, of the Repertory of Arts, mentions this fact, on page 139: that attaching two of the coal waggons together, would produce the car known as the double-truck eight-wheel car, of which the four pair of wheels arrange themselves to the curves of the railways. His description in the book referred to, is amply sufficient for a mechanic of ordinary skill, to construct the eight-wheel car, substantially the same as those now used in this country.

One method of applying this principle to a steam carriage, is distinctly shown as the invention of Chapman, in the London edition of Wood's Treatise on Railways, printed in 1825.

In that engraving, the steam carriage is shown with the ends of the frame of the body resting on bolsters, one of which, at each end, rests on a bolster or cross-piece of the truck-frame, and a centre pivot or transom bolt connects the ends of the carriage frame and the centres of the trucks, the same as in the passenger carriages now in use. The wheels in that engraving are a distance apart much less than the diameter of the wheels; and are about the same distance apart as the passenger cars now in use in this country.

The distance of the trucks apart, in that engraving, is a collateral matter, depending upon the contingency of the length of the body, which may be varied; still presenting the feature shown in the engraving, that the ends of the frame of the body rest on the centres of the truck-frames. In that engraving the length of the carriage frame brings the trucks so near together, that a central cog wheel can be and is shown as used to communicate the power between them; and in that day, 1825, when the length of the carriage was required to be much greater, the middle cog wheels could be increased, either in size or number; or equivalents or substitutes to communicate the power existed in locomotive engines, being the endless chain principle, shown in plate 1st, fig. 2, Letter G, of Tredgold's Treatise on Railroads and Carriages, and published in London, in the same year, 1825. And another known equivalent was cranks, to turn cog-wheels at right angles to the engine crank, coupled by the usual arm.

A method of connecting all the wheels of a train, to turn a curve by the power of the wheels, was also patented in England, to W. H. James, 5th March, 1825. Known equivalents, therefore, existed at and before 1825, to operate the Chapman steam carriage, with as long a body as might be desired, and the trucks consequently as far apart as the contingent fact of the length of the body, having its ends resting on



their centres, as shown in the engraving, might place them. The application of power through the cog-wheel gearing, in the Chapman carriage, in Wood's Treatise, would produce normal pressure on the trucks, relatively to the track; and the weights of passengers as freight in the eight-wheel cars now in use, would also produce normal pressure on the trucks, relatively to the track, being in both cases the same thing. The friction of the gearing caused by the pressure in applying the power, in the Chapman steam carriage, would, together with the weight of the body, tend to give the trucks a proper degree of steadiness on the straight track, taking into account the proper distance of the wheels apart, as shown in the engraving, prevent frivolous or constant lateral wobbling; and the friction caused by the pressure due to the weight of passengers or freight, in the eight-wheel cars used in this country, together with the proper distance of the wheels apart, tend to produce the same beneficial effect. Neither the application nor the removal of the gearing to the trucks in the Chapman carriage for making them drivers to a steam carriage, would alter or impair the principle that there exists, of a single carriage body of any desirable length, having its ends connected by bolsters and pivots, or transom bolts, to the centres of two four-wheel trucks, to conform to the curves of the road, the wheels of each truck being a distance apart less than the diameter of each wheel, and suited to the curves of the road, the proportion of straight line of road, and the lateral space allowed between the flanges and the rail. As these are considerations that regulate the distance of the wheels apart, they must be far enough apart to run with sufficient steadiness on the straight line of road, and not laterally and frivolously wobble, as they would do, similar to a single pair of wheels, if they were too close together; and must be sufficiently near to each other, not to bind between the rails; and all the *elastic* action of the wheels and axles, is and must be made alone *normal* to the track.

The engraving shown in Wood's Treatise of 1825, embodies and contains identically the same principle of construction and operation of the eight-wheel passenger and freight cars used on the railroads of the United States; and the connecting point of draft or coupling, is from the centre of the body, the same as the eight-wheel passenger and freight carriages and engines used in the United States.

I never heard of this invention of the eight-wheel passenger and freight cars attributed to any one else than William and Edward Chapman, of England. They were employed by J. G. Lambton, afterwards the Earl of Durham, to whose son, the present Earl of Durham, I was engaged as mathematical tutor.

The steam carriage, as shown by that engraving, in Wood's treatise, was successful in every particular, and operated in the Heaton colliery, drawing heavy freight trains. I have often discussed the principle with his engineers and coal masters. Tredgold's Treatise on Railroads and Carriages was published by Josiah Taylor, No. 59, High Holborn, London, in the year 1825. I know him personally, and I owned or possessed a copy of the book in 1828. A correct and original one of this publication, by Thomas Tredgold, belongs to the library of the Franklin Institute of the State of Pennsylvania, and is numbered in the library, 2nd class 67. This book is now before me. This, the original publication, by Tredgold, in 1825, contains a full description of a long-

bodied eight-wheeled car, for conveying freight and third class passengers, supported by two four-wheel trucks under each end of the body. The drawing is given on plate IV, fig. 26, and the description is contained on pages 179, and also on pages 94, &c.

I have examined them carefully and fully. A correct model of this Tredgold car, marked A, made precisely in accordance with the description and drawing in that book (and which I marked with my name on a piece of paper attached to the truck) is now before me.

Any mechanic of ordinary skill in building waggons or cars, could make and use the car similar to the model, from the drawing and description printed in the Tredgold treatise, published in 1825.

The chief points of difference between this waggon or car, and the common road waggon, are the frame work or truck having four wheels, one truck under each end of the body, and the pivot or axis on which it turns, being in the centre of the length of the truck or bolster-frame, in addition to being in the middle of the breadth of the waggon, as is the case with the common waggon bolsters on each other, or else stout pieces of framing, always accompany these axes, sometimes called the transom bolt, whether on the common road waggon or on the common road steam carriages, and also guide curves, concentric with the king-bolt, were well known, combined together, before Tredgold's work of 1825.

All the material improvements of the double-truck eight-wheel rail-road car over the common road waggon, are clearly set out in Tredgold's description, and the drawing shows the vertical axis in section at A, A, in its cylinder base, in the centre of the length of the frame, and, like the road waggon also, in the middle of the breadth, on which the frame turns, to suit all the inequalities of the road. The centre of the length of this frame is the actual centre of the frame, and its being in the centre relatively to the length or distance, or distance of the axis of the wheels from it, is a very important point in the operation of the truck.

If the wheels be thirty-two or thirty-three inches in diameter, the distance between their flanges should be at least twenty inches, when the radius of the least curve of the road is 400 feet, and more distant if the least curve be larger. The distance of the wheels apart in each truck, in Tredgold's drawing, is less than the diameter of the wheels, and is a proper distance for good running on curves, as well as on the straight tracks.

The distance of the trucks apart depends upon the length of body, which may be variable—sometimes longer, sometimes shorter. They must, however, be sufficiently long to allow each end of the body to rest on the centre of the length of the truck-frame. The body, in the Tredgold drawing, is double the length of the body of a four-wheel car, and the trucks are a proper distance from the ends of the body to protect them from injuries by cars running together, to be connected in the same train. The length of the car body, and the disposition of the wheels, is the very best that can be made; because it is well for both the curves and straight line of road, and distributes the weight uniformly on the road. The cross-pieces to sustain the axes of the trucks, in this drawing, are not separate from the frame of the body or truck. The upper cross-piece is part of the body frame, and the lower cross-piece is part of the truck-frame, secured by joint bolts to the side pieces, as

shown in the drawing and in the model. The axis, and its socket A, and the fastening in the drawing, show the position of these pieces. They are used with the axis or centre pivot, in the ordinary way of a common waggon. The only thing new or different from a common, is the frame for the four wheels, the axis in the centre of its length, the proper distance of the wheels apart in each frame, and the double or long body supported by each end, properly resting on the centres of these four-wheel frames. Cars constructed like the Tredgold car, with the addition of the then (1825) well known mode of applying springs to the framing, that is, by a pedestal confining their action normal to the track, are extensively used, at the present time, on the Pennsylvania road.

The inequalities of the road that the Tredgold car is calculated and suited to conform to, are of three general kinds.

1st. Vertical perpendicular to the plane of the road, such as sinuosities on the surface of the rail, and at the joints. Splices of the outer rails in joining curves and straight lines of the road, the elevation of outer rails of curves of the road, and the regular grades of the road.

2d. Lateral in the direction of the road, such as defective ballasting and joining, and the defective laying of sleepers, which always will exist to some extent.

3d. Horizontal and perpendicular to the course of the track, such as splices, curves of the road, switches, sinuosities at the edges and at the joints of the rail, and the grades of the road. It is well fitted to traverse the curves of the road, because the wheels are a proper distance apart, so as not permit the truck to assume too oblique or obtuse an angle to the curve, which is the case with trucks having the wheels too close together, and causes the off foremost wheel to bear too violently against the outer rails, either break them, wear them and the flange of the wheel away rapidly, or else catch and run off the track.

The universal law, that all bodies in motion tend to move in straight lines, causes this destructive action of the truck, when the wheels are too close together. Neither should they be too far apart; that is, so far apart as to fill up the whole of the chord of the segment of the curve between them, for then they would be liable to bind; but as this would cause the mean line of the axles of the wheels to be perpendicular to the curve of the road, which is the best position to have the least bearing against the outer rail, and consequently is the most safe and economical, so that the wheels do not bind. The wheels, therefore, should be a little closer together, that the distance necessary to have their bearing points fill up the length of the chord of the segment of the shortest curve on the road between the wheels. The distance would of course vary with roads having the shorter curves, with different radii; but this that I have stated is the rule; and having the wheels as far apart in each truck as the curves will permit, also enables them to run more steadily on the straight line of road, and distribute the weight better on the rails than if they were placed as close as possible together, without their flanges touching, as this would concentrate the weight too much on the rail, and also allow the truck to wobble laterally and frivolously on the straight line of road, to the injury of the road and truck, and endangering the safety of the train.

This injury would arise in the mode described by the specification

of Ross Winans, of October 1st, 1834. The majority of cars of this country, have the wheels in each truck about twenty inches apart, some more and some less; those having them a greater distance apart, are decidedly the safest, most economical, and easiest running, both on the curves and on the straight line of road.

The Tredgold car has its chief principles included in the Chapman engine, and this Tredgold car is identical, in its principle of construction and operation, with the eight-wheel double-truck passenger and freight cars now used on the railroads of the United States.

I have attentively read and am acquainted with the specification of Ross Winans's patent for an eight-wheel car, dated October 1st, 1834.

A correct model of this car is now before me, and marked B, and I have signed my name on a piece of paper attached to the truck of the same.

OLIVER BYRNE.

Taken, sworn and subscribed, July 19th, 1852, before me.

CHARLES F. HEAZLITT, *U. S. Com'r.*

*United States of America, Eastern District of Pennsylvania, Sec.*

I, George Plitt, Clerk of the Circuit Court of the United States of America for the Eastern District of Pennsylvania, in the third Circuit, do hereby certify, that I am well acquainted with the hand-writing of Charles F. Heazlitt, Esquire, whose name is subscribed to the annexed certificate, and that the signature of the same is in his proper hand-writing. And I do further certify, that he was at the time of signing the same and still is a Commissioner of the said Circuit Court.

In testimony whereof I have hereunto subscribed my name, and affixed the seal of the said Circuit Court, at Philadelphia, this nineteenth day of July, in the year of our Lord one thousand eight hundred and fifty two, and of the Independence of these United States the seventy-seventh.

[Signed,]

GEORGE PLITT, *Clerk of C. C.*

CIRCUIT COURT UNITED STATES—NORTHERN DISTRICT OF  
NEW YORK.

ROSS WINANS vs. ORSAMUS EATON, ET AL.

EASTERN DISTRICT OF PENNSYLVANIA, SS.

Oliver Byrne, being duly apprised according to law, deposes and says that he is the same person who made a former affidavit in this cause. That Tredgold's Treatise on Railroads and Carriages, published in London, in 1825, No. 67, belonging to the Franklin Institute, is now before me, and is the same book of Tredgold's spoken of by me in my former affidavit. I am practically acquainted with the railroads in England, in France, in Ireland, in Scotland, in Germany, and in Spain; and they all have curves of double curvature, that is, curves that are not in a plane. They are curves that cannot be described to lay wholly in a plane. All railroad curves are curves of double curvature, and all railroads, both in England and America, have these curves of double curvature. All railroads are in fact composed of curves of double curvature. Tredgold's book speaks of curves of double curvatures on page 135. The



words: "When a considerable degree of curvature is given to a railroad, the rails of the outer curve should have a slight rise to the middle of the curve, and the rails should be stronger in a lateral direction in both lines. The object of making a slight ascent to the middle of the curve of the outer rail, is, to counteract the tendency of the carriage to proceed in a straight direction, without its rubbing so forcibly against the guides as we have observed in cases where roads have had a considerable curvature." These words express a railroad with curves of double curvature, and the objects to be overcome in travelling them. The rubbing of the off-rail cannot, however, be altogether prevented. To conform to the changes of level on a railroad, it is necessary for the Tredgold car to have its trucks turn on a vertical pivot or axis, equidistant from the points of contact of the wheels to which it belongs, with the rails; as this is the only mode of equally distributing the pressure among the wheels, and of conforming to the changes of level of the road, in running on a railroad, which are the objects of the Tredgold car. The axis of the wheels of this car described by him, and shown by the model letter A, identified in my former affidavit, and now before me, are not in the same plane in traversing the curves of double curvature described by Tredgold, and in passing from a straight line to a curve, as the level always changes. The model A, therefore, as constructed, is correct to the purpose and description of Tredgold, in this particular of suiting the changes of level on the rails. And in another very important particular, the model, as constructed, is strictly correct to the description and purpose of the book, viz: "That the pressure may be divided equally among the wheels," "that each wheel must bear an equal pressure." And no other principle of construction in mechanics could or would equalize the pressure on the wheels, than the one shown in the model A, and the description and drawings of Tredgold's book of 1825. This carriage, called his "eight-wheel carriage," is to run on the rails of a railroad; he says, "the body must be sustained so that its pressure may be divided equally among the wheels;" its connection with the two four-wheel-frames is "so as to allow the greatest possible change of level on the rails," and "obvious that each wheel must bear an equal pressure." The pressure of the body of an eight-wheel car freighted with goods or passengers, on the wheels, from the body in motion on the rails, is intermittent, dynamical pressure, and not statical, as that of a weight at rest; and to be equalized on the wheels in the frames or trucks, the body must rest on centres or a vertical axis in the middle of each truck, equidistant from the wheels, as shown in the drawing and model A, of Tredgold. No other construction will equalize the pressure on the wheels, nor on the rails of the road. This intermittent dynamical pressure, is a constant acting and reacting force, between the car body and the four wheels in each frame, communicated through the centre bearing and axis, equidistant from the wheels, and is normal to the track. No other pressure than this "intermittent dynamical pressure," transmitted from the body, on the wheels and on the rails, exists from the body of an eight-wheeled carriage in motion, and this is the pressure that Tredgold recognizes, and distinctly speaks of, in the words, page 94, "the body must be sustained, so that its pressure may be divided equally among the wheels," and "it is obvious that each wheel must bear an equal pressure;" and

on page 179, again, "so that the stress of each wheel on the rails of a railroad may be equal," and when he describes and shows the construction of the carriage in these words, page 94: "In the case where eight wheels are applied to support one body, if the body rests upon the wheel frames of each set of four wheels, in the middle of its length, (see fig. 26, plate iv) and is connected with those frames so as to allow the greatest possible change of level on the rails," and again, on page 179, "The body of the waggon rests on the wheel frames at A A, and is connected to them by an axis, on which the frames turn, when from and [?] inequality, the axes of the wheels are not in the same plane." He describes and shows a carriage body, with a vertical axis in the centre of each four-wheel frame, and resting on that centre, precisely as shown by the model A; and no other construction than the central vertical axis, as there shown, would allow "the greatest possible change of level on the rails," and allow the "frames to turn, when from any inequality the axes of the wheels are not in the same plane;" and none other than the circular cylindrical bearing around that vertical axis, as shown by Tredgold, and by the model A, would equalize the pressure of the body among the wheels, and make the stress of each wheel on the rails equal, in running on the rails. In the drawing, figure 26, given by Tredgold, the letter A, under the round end of the verticle axis to each wheel frame, showed that axis in the centre point of the cylinder case also shown around it, and that that axis with its bearing is the point equidistant from the four wheels, on which the body of the carriage communicates its pressure, and receives the reaction through the same point when in motion, and thus equalizes the pressure from and among the wheels. The lower end of the vertical axis being round, shows that it terminates with a semi-globular form, and in mechanical drawing, that the axis is round.

The character of this drawing being in sketch or outline, shows that the principle of the car there described was not new in 1825, when the book was made. The principle was well known and settled at that time. I have in England made many books on mechanics and engineering, and it is generally an understood thing, among engineers, draftsmen, and book-making etiquette, that where the drawing is shown in sketch, such as in figure 26, the principle of construction and the operation is not put there for the first time as new. In figure 26, if that were not a cylinder with an axis inside over the letter A, in each wheel frame, it would not be represented by two double lines at each side, making for each wheel frame four short perpendicular lines, and in fact showing a vertical cylinder and its vertical axis for each wheel-frame of four wheels.

The small single circle shown on each side piece that rests on the axes of the wheels, is a detent pin, or fixed joint bolt, to secure the tenon of one end of the cross pieces of the wheel frame in its mortise, which mortise it was common to cut only a short distance into the side piece, and secure it by a joint bolt, as shown in the model A, and not extend the mortise all the way through the side piece, as that would cut away and injure the strength of the side piece. A short tenon and mortise and joint bolt, as shown in the model A, is delineated and understood by the small single circle on the side piece, and has always been a common mode of making a very strong timber fastening. These

joint bolts are used in the same way, to construct the trucks of cars at the present day, and also in constructing ships and roofs. All strong timber framings, where the whole strength of the material is required, have been and still are made by joint bolts. The drawing, figure 26, is such as draftsmen employ to show, by dotted lines and section lines, all the details of the thing represented, without the employment of separate figures. In the drawing, figure 26, the wheels are shown outside of the wheel-frames and body, by the employment of dotted lines; the vertical cylinder and axis to each frame is shown by four vertical lines, extending between the frame of the body and the frame of the wheels, and terminates on the top of the middle cross piece of the frame, that is secured by the small single circle or fixed joint bolt to the side piece. The double lines of the axes of the wheels, and the frame with a socket resting on the axes, shows a solid hub and wheel and axle, revolving in the frames, and the word "axes" itself also signifies the same thing; the double lines to the vertical axis shows that the axis there is turned on, and so the description states; and the small single circle on the side piece, shows, by its being a single circle (and not a double circle), that it does not move, but is a fixed joint bolt, all as shown in the model A.

I have examined the model platform C, bolted to the cross axletrees in frames C, C, and have written my name on the papers attached thereto. This model is not the thing described in Tredgold's book on Railroads and Carriages, of 1825. There is no cross axletree with a journal on each end, mentioned or shown or intended to be shown, in Tredgold's book. The cross pieces upon which letters C are marked, in model C, and on which the platform is bolted, are cross axletrees, each with two journals, one on each end of the axletree, extending through the side pieces of the wheel-frame. The axes of the wheels shown by Tredgold, and in model A, are *axes in peritrochie*; they are not axletrees. But the cross pieces C, C, in model C, are axletrees, and not axes of any sort; and Tredgold describes an axis, but not an axletree. The axletrees C, C, in model C, allow the frames to rock vertically on the journals, but not to turn; and no elevation given to them could make the frames turn. The object of Tredgold's car is obviously to run on a railroad, to distribute the pressure among the wheels, and to show the greatest possible change of level on the rails. The model C would not perform any one of these functions. It would not run on a railroad, because all railroads have curves of double curvature, and model C would not run on a curve of any sort. On striking a curve it would run off the rails on to the ground. It would not divide the pressure equally among the wheels, because the pressure of the body is not communicated from a point in each frame equidistant from the bearing points of the wheels on the rails. A weight on the platform C, in motion on plane at the point X, would give the greatest pressure to wheels 1, 1, still less to the opposite wheels, still less again to the wheels 2, 2, and still less again to their opposite wheels, being an unequal pressure, and not an equal division of pressure, as required by Tredgold. And again, the model C would not allow the greatest possible change of level on the rails, as where a change of level takes place on a curve, and peculiar to curves, the model would run off the rails, and therefore not allow this change of level, as the frames are prevented

from turning to conform to it. It would not, therefore, perform any one of the purposes of the Tredgold car, as expressed on page 94. The axletrees C, C, in model C, are part of the body, and not part of the wheel frames; because they are permanently attached to the body, and not to the wheel-frames. No such axletree, and no axletree whatever, is described or shown or indicated in Tredgold, either attached to the body or elsewhere; he expresses no purpose to require it; and, permanently attached to the body, it is of no practical use whatever for a car to run on a railroad. It could only be used for a car to haul boats out of the water on an inclined plane; but in that case the journals, instead of going through the side pieces, as in the model C, and weakening them where they require the greatest strength, would have to be set in pillow blocks, and mounted on top of the side pieces, as is shown in the truck D, signed by me, so as not only to preserve the strength of the side pieces, but also to increase it, and allow the journals to be introduced and removed when required. Any common mechanic would know this, and certainly Thomas Tredgold knew it, for he was one of the greatest engineers and writers on the strength of materials that Europe has produced; and no mechanic of common sense would take the small single circle on the side pieces for a journal of a cross axletree.

The model C, with the cross axletrees C C, differs also from the description of the plate iv, fig. 26, on page 179, and the fig. 26 itself, in these respects.

The stress of each wheel on the rails of a railroad in every position of the load, is not equal among the wheels in each skeleton frame, nor among all the wheels. Tredgold's specification requires it to be equal. The body of the waggon does not rest *on* the wheel-frames, but rests *on* and is bolted to a cross axletree, which rests by journals *in holes through the side pieces* of the frame. This frame not having any cross tie or middle piece to stiffen and strengthen it, would lose the form of a rectangular parallelogram, and assume that of a twisted rhomboid, which any mechanic of the most ordinary capacity would know, and that the body did not rest as described and shown in Tredgold's book. Also, the body in model C is not connected to the wheel-frames by an *axis* on which the frames *turn* when from *any* inequality the *axes* of the wheels are *not* in the same plane; but the body C is connected to the wheel-frames by a *cross-axletree* with *two journals* on which the frames *rock*. It would not conform to *any* inequality when the axes of the wheels are not in the same plane, as it would not conform to the vertical inequality peculiar to a curve, and would not run on a railroad. And in reference to the drawing, the model C does not correspond with it, but differs in these particulars:

The ends of the axletree in the model shows only *two* vertical lines; the drawing shows *four* vertical lines. The journal of the axletree in the model, has the side piece of the frame to *move* or *rock on it*, while the drawing shows a *single* small circle on the side pieces, indicating that *they are stationary*, that the side piece does *not move on it*; a *double* circle would be required to denote *motion*, with a journal surrounded by a box. Above the letter A, in the drawing, the round vertical axis is indicated or shown by a circular arc and the four lines, in the usual way. No such arc or figure belongs to the cross axletree.



The drawing itself thus shows that, without the description, the model C does not represent the same thing.

The drawing, fig. 26, is so plain, that even without any description, an ordinary mechanic could construct an eight-wheel car from it, the same as model A, and like the eight-wheel cars used on the railroads of the United States; and is so plain and so palpable and so simple, that a further delineation could add nothing to enlighten a mechanical mind, as, with the description given, it is fully sufficient and clear in every respect.

I will now refer to the three truck models before me, viz., the trucks C C, of model C, the truck D, and the trucks A A, of the Tredgold model A, for the purpose of illustrating that by no possibility of adding vertical axes to the cross axletrees, in trucks C and D, could they be made to distribute "the pressure equally among the wheels," as described and required by Tredgold, and performed by the model A, which is the described car in Tredgold's book. It will be seen that the cross axletrees C C, in platform model C and D, in truck D, apply the pressure of the body of the car, to the skeleton wheel-frame, by the journals at their ends, resting and rubbing in bearings in the side pieces of the skeleton frame, and through these two opposite side pieces and journals, the pressure of the body is communicated to the wheels, but not equally, because these two journals are two points of bearing, and neither one of them is equidistant from the bearing points of the four wheels on the rails.

In the truck D, the cross axletree D is no part of the skeleton wheel-frame, but is a an independent moving piece. In the model C, the cross axletrees C C, with the platform C, bolted on them, are part of the car body or platform, because they are permanently fixed to it, and are no part of the skeleton wheel-frame, because the frame moves independently of them, and they are not permanently fixed to the frame. These frames are skeleton frames, therefore, because they have no permanent cross pieces to tie and hold the skeleton parallelogram firmly together.

They are not complete wheel-frames, as described by Tredgold, nor capable of communicating and resisting the pressure between the body and the wheels, and because they have not the permanent cross piece to complete the frame, so as to receive and sustain the pressure. The trucks A A, are the only ones that have a complete wheel-frame, made so by the cross piece to each in the middle, with a short tenon and mortise in the side pieces, fastened to them permanently by the joint bolts, and thus being part of, and completing the frame, and supporting the vertical axis, on which the frame is at liberty to turn, and the frame being thus a permanent body, has no loose point to attract the pressure, but by the law of transmitting force through solid matter, communicates the pressure directly from the vertical axis, to the point of the wheel bearing, which are equally distant.

In the truck C, C, the cross axletree being part of the body, as it is permanently attached to it, the body has two points of bearing on the skeleton wheel-frame, viz: at the two journals, one in each side piece, differing also in this respect from Tredgold's description, for he gives only one point of bearing, for the body on each wheel-frame, and by

the single letter A, fixed under the vertical axis, as well as by his general description and drawing, fixes that point in the middle of the length of the frame, as the bearing point. If Tredgold had said that the body rested on the frame in the middle of its breadth, the point of bearing in mechanics would have been identically the same; but the word breadth would have expressed nothing different in principle from the axis and bearing of a common waggon, and, further, would not have developed to the mechanical mind, that it is the length of the four-wheeled frame relatively to this axis and bearing point, and not the breadth, that develops the important principle of causing the truck or wheel-frame to turn on its axis, "when from any inequality the axes of the wheels are not in the same plane," because the length predominates in giving the leverage from the axes that causes the truck to turn, both on the straight line of road, and on the curved line of road, from any inequality that throws the axes out of plane, and gives the turning of the truck across the direction of the road, which the breadth of a common road waggon does not possess or give, but gives the turning exclusively in the direction of the road. The turning of a four-wheel truck is both across the direction of the road, and in the direction, and consequently embraces the principle of the front frame-work or running gear of a common road waggon. It would not have been correct, either, for Tredgold to have said that the body rested in the centre of the frame, because the centre of the mass of the frame would be the actual centre, as the centre of the earth, for example, is the centre of its mass, and the body could not properly rest in the centre; besides, the word centre would not express the new principle of motion of the truck that length gives; and the word length brings to the mechanical mind the fact, that the distance from the centre of the axles to the bearing point in the length of the frame, or direction of the road, gives the degree of leverage to cause the truck to run steadily on the rails. The expression of Tredgold is strictly correct, for the length is the only variable dimension, as the breadth between the rails is fixed and constant. Besides, the point in the middle of the breadth had been long agreed upon and settled, as the proper point for the axis or pivot, and of bearing in the common road waggon, and also in rail-road waggons, and required no express mention being made of it, as his expression, *in the middle of the length*, is necessarily in the middle of the breadth; and being in the middle of the length, the length gives the balancing leverage on the opposite wheels of the diagonal; thus keeping the truck balanced on the track, when it turns, from any inequality on the rail, either on the straight line of road, or on the curved line of road. This resistance to the wheel caused by an inequality on the surface of the rail, is at right angles to the normal pressure; the amount of which is equally distributed among the whole eight wheels, when the car is in motion. The vertical axis and bearing, for the body, in the middle of the length of the frame, in the model A, agrees with this part of the description of Tredgold, as well as with the drawing; and on this axis the frames turn, "when from any inequality, the axes of the wheels are not in the same plane." An inequality, for instance, at the joints of a rail, whether in elevation or depression, and any other inequality on the surface, or change of level, or direction, causes a resistance to the wheels on one side, in the direction of the road, for the time;

which makes the wheel-frame yield or turn, to relieve itself of the abrupt *force* of the shock ; and the wheel-frame, as the car progresses, turns back again to recover itself, and brings its axes in plane. This takes place on all parts of the road, whether straight or curved, and on best constructed roads ; and the space between the rails allowed for the turning of the truck, is from one and half to one and three quarters inch on railroads generally. I have watched the trucks of eight-wheeled cars, and seen the action take place ; and it is very important in the operation of the trucks. The model C, and trucks C, C, and D, would not give this necessary turning action between the rails ; but would communicate the whole of their force or shock, given in the direction of the road to the body of the car, and tending to make it climb the rail and run off the track. It will be seen that in truck C, C, and D, the cross axletree C, C, and D, have a vertical hole in the middle, equidistant from the points of bearing of the four wheels. Now, suppose the platform C to be unbolted, and taken off the axletrees C, C, and that a car body with vertical axis in those vertical holes rested on the axletrees, these axletrees would then, like the axletree D, be, and move independent, both of the body and of the skeleton frames, and be no part of either, and there would be three loose points of bearing in each truck, viz., the vertical axis, and the two end journals of the axletrees ; and when the car is in motion, the skeleton frames will turn in conforming to the changes of level peculiar to a curve, and to a straight line of road, in passing in the direction of the road, from either the curve upon the straight line, or from the straight line upon the curve ; but the pressure will not be equally distributed among the wheels, as required by Tredgold, for these reasons : The body would not rest upon a point equidistant from the wheels, but would rest across and upon, and move upon the cross axletrees ; and when the body is in motion, sometimes it would bear strongest upon one journal of the axletree on one side, and sometimes strongest upon the other journal on the other side. The consequent looseness and latitude of the three movable bearings, will give a variable pressure to each pair of side wheels, as they encounter the successive irregularities of the rail. In fact, the journals of the axletrees will not be all the time pressing against the bottom of their bearings, nor will they always have a tendency to do so, on account of the reaction, and this will be the case whether the load lies equally adjusted or not. And if the load be not equally adjusted also in addition, the greatest pressure will be given to the wheels on the side on which the heaviest portions of the load bears.

An object of Tredgold's *eight-wheeled carriage*, as described by him, is to divide the pressure equally among the wheels, so that *each wheel* must bear an *equal pressure*, not by adjusting the load, but really to *divide* the pressure *equally* by the mode of sustaining the body ; for he says, "the body must be sustained so that its pressure may be divided equally among the wheels." "In the case where eight-wheels are applied to support one body, if the *body rests upon the wheel frames* of each set of four-wheels, *in the middle of its length*, (see Fig. 26, *Plate IV*), and is connected with those frames so as to allow the greatest possible change of level on the rails," it is *obvious* that "*each wheel* must bear an *equal pressure*," and when he refers to six-wheels in these words : "If one frame with its four-wheels be removed, and an axis



with two-wheels applied in its place, the carriage would have six wheels, and it would be easy to *adjust the load* so that the pressure on *each pair* of wheels would be equal." He shows that he knew that when the wheel-frame and its vertical axis and central bearing, on which it was to turn, were removed, and a single wheel axis, with its pair of wheels, was substituted, which would be an axis in *peritrochio*, without a vertical central axis, the weight could only be distributed *by adjusting the load*, and equally on the *pairs* of wheels; and not among the wheels, equally on *each* wheel, as is the case with his *eight-wheel*ed carriage, by its connection with its two four-wheel frames, as described and shown in his book and in the model A. It would, therefore, when he has shown that he knew that a single axis, in *peritrochio*, or an axis with its pair of wheels in place of the wheel-frame of four wheels, would by not having the vertical axis and central bearing, require an *adjustment of the load*, to divide the pressure equally among the *pairs* of wheels, be most unreasonable to suppose that he intended to describe a cross axletree for the eight-wheel carriage, which would totally destroy all equalization of pressure, both among the wheels in pairs and also singly, either with the vertical axis, or a body C, bolted permanently to the axletrees C C. As he does not mention, or pretend to describe, or show, a cross-axletree, of any sort, either belonging to the car body or independent, and shows that he knows by substituting a single-cross-axle with two wheels (an axis in *peritrochio*) though not an axletree for the frame with its four-wheels, reducing the equalization to *pairs* of wheels by *adjusting the load*. And when, in the eight-wheel carriage as described and shown, he equally knows and expresses that his mode of construction and connecting and operating the body and wheel-frames, *divides* the pressure, so that *each* wheel must bear an equal pressure, and describes, and shows the construction and operation of the model A.

In this Tredgold model A, the substitution of the longer body A 2, on the same trucks, at the same distance from the ends of the car body, if the trade of the road required the use of this more capacious body, would not be a discovery, or invention, or new principle, because the trucks would necessarily be further apart, the length of the body never governs the construction of the trucks. It is the road that regulates the size of the trucks and the distance of the wheels apart, and the proper distance of the trucks from the ends of the body, and the proper distance of the wheels in each truck apart, are shown by Tredgold, and no mechanic would have any cause to change them in putting on a longer body; the construction of the body involves no invention, whether it places the trucks five feet or twenty-five feet apart. Every mechanic knows that the strength of the body must be increased in proportion to its length, and the weight or load it has to carry; but this produces no change of principle, or no new combination. The Tredgold car is identically the same in principle of construction and operation as the eight-wheeled cars now generally in use on the railroads of the United States.

[Signed,]

OLIVER BYRNE.

Affirmed and subscribed, this 19th day of August, 1852, before  
CHARLES F. HEAZLITT, U. S. Com. E. D. Pa.



**RESPONDENT'S EXHIBIT, No. 2.**

**RECORD.**

**ROSS WINANS vs. THE NEW YORK AND HARLEM RAILROAD COMPANY.**

THE PRESIDENT OF THE UNITED STATES OF AMERICA, TO ALL TO WHOM THESE  
PRESENTS SHALL COME, Greeting :

Know ye, that we having inspected the records and files of the Circuit Court of the United States for the Southern District of New York, in the Second Circuit, do find certain paper writings there remaining of record, and the whole of the recorded proceedings in the words and figures following, to wit :

THE PRESIDENT OF THE UNITED STATES OF AMERICA, TO THE MARSHAL OF  
THE SOUTHERN DISTRICT OF NEW YORK :

We command you to summon the New York and Harlem Railroad Company, being a citizen, person, and inhabitant of the State of New York, duly created by a law of said State, to be and appear before the Judges of the Circuit Court of the United States of America for the Southern District of New York, in the Second Circuit, to be held at the City Hall, in the City of New York, in the said Southern District, on the sixteenth day of January, eighteen hundred and forty-nine, to answer unto Ross Winans, a citizen of Baltimore, in the State of Maryland, Plaintiff, in a plea of trespass for infringing Letters Patent granted to the said Plaintiff by the United States of America, for a new and useful improvement in the construction of cars, or carriages, to run on railroads, on the first day of October, 1834, and extended for the term of seven years from and after the first day of October, 1848, under the statutes in such case made and provided, so that the said Letters Patent now have the same effect in law as though the same had been originally granted for the term of twenty-one years : To the damage of the said Plaintiff, ten thousand dollars; and have you then and there this writ :

[L. S.] Witness, Roger B. Taney, Esquire, Chief Justice of the Supreme Court of the United States, at the City of New York, the twelfth day of January, in the year eighteen hundred and forty-nine.

ALEX. GARDINER, *Clerk.*

GEORGE G. SICKLES, *Attorney.*

**UNITED STATES CIRCUIT COURT FOR THE SOUTHERN DISTRICT  
OF NEW YORK.**

ROSS WINANS vs. THE HARLEM RAILROAD COMPANY.

Summons returnable January 16, 1849.

Geo. G. Sickles, Attorney, 79 Nassau street.

Filed January 16th, 1849.

I hereby depute Joseph Thompson to execute the within process.

Dated, 18th Jan., 1849.

ELY MORE, *U. S. Marshal.*

Personally served on the President of the Harlem Railroad Company.  
16 Jan., 1849. ELY MORE, *U. S. Marshal.*

# CIRCUIT COURT OF THE UNITED STATES

FOR THE SOUTHERN DISTRICT OF NEW YORK.

THE NEW YORK AND HARLEM RAILROAD COMPANY *ads.* ROSS WINANS.

Please to enter my appearance for Defendants in this cause. *New York, January 17, 1849.* Yours, &c.

C. W. SANDFORD, *Attorney for Defendants.*

ALEX. GARDNER, Esq., *Clerk, &c.*

## Declaration.

G. W. G. Sickles, Plaintiff's Attorney, 79 Nassau street.  
Filed February 6, 1839.

# CIRCUIT COURT OF THE UNITED STATES,

FOR THE CIRCUIT AND SOUTHERN DISTRICT OF NEW YORK, JAN'Y 29, 1849.

SOUTHERN DISTRICT OF NEW YORK.

Ross Winans, a citizen of Baltimore, in the State of Maryland, complains of New York and Harlem Railroad Company, being a citizen, person, and inhabitant of the State of New York, duly created by a law of said State, duly summoned, &c. For that whereas the Plaintiff was the original and first inventor of a certain new and useful improvement in the construction of cars or carriages to run on railroads, in the letters patent hereinafter mentioned fully described, the same being a new and useful improvement in the construction of cars or carriages to run on railroads, which was not known or used before his said invention, and which was not at the time of his application for a patent, as hereinafter mentioned, in public use, or on sale with his consent or allowance, and the Plaintiff being so as aforesaid the inventor thereof, and being also a citizen of the United States, on the first day of October, 1834, upon an application did obtain certain letters patent therefor, in due form of law, under the great seal of the United States, duly signed by the President of the United States, and approved by the Attorney General, bearing date the day and year aforesaid, whereby there was granted to him, his heirs, administrators, or assigns, for the term of fourteen years from and after the date of the said patent, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement in the construction of cars or carriages to run of [?] railroads, a description of which is given in the words of the said Ross Winans himself, in the schedule attached to said patent, and making part thereof, as follows:—

To all to [?] whom it may concern: Be it known, that I, Ross Winans, civil engineer, of the City of Baltimore, in the State of Maryland, have invented a new and useful improvement in the construction of cars or carriages intended to travel upon railroads; which improvement is particularly adapted to passenger cars, as will more fully appear by an exposition of the difficulties heretofore experienced in the running of such cars at high velocities, which exposition I think best to give in this specification, for the purpose of exemplifying the more clearly the object of my said improvement.

In the construction of all railroads in this country which extend to any considerable distance, it has been found necessary to admit of lateral curvatures, the radius of which is sometimes but a few hundred feet; and it becomes important, therefore, so to construct the cars as to enable them to overcome the difficulties presented by such curvatures, and to adapt them for running with the least friction practicable upon all parts of the road. The friction which I now allude [?] is that which arises from the contact between the flanges of the wheels and the rails, which, when it occurs, causes a great loss of power, and a rapid destruction of or injury to both the wheels and the rail, and is otherwise injurious. The high velocities attained by the improvements made in locomotived [?] engines, and which are not only sanctioned but demanded by public opinion, render it necessary that certain points of construction and arrangements, both in the roads and wheels, which were not viewed as important at former rates of travelling, should now receive special attention. The greater momentum of the load, and the intensity of the shocks and concussions, which are unavoidable, even under the best constructions, are among those circumstances which must not be neglected, as the liability to accident is thereby not only greatly increased, but the consequences to be apprehended much more serious. The passenger and other cars in general use upon railroads have four wheels, the axles of which are placed from three-and-a-half to five feet apart—this distance being governed by the nature of the road upon which they run, and other considerations. When the cars are so constructed that the axles retain their parallelism, and are at a considerable distance apart, there is a necessary tendency in the flanges of the wheels to come into contact with the rail, especially in the curvatures of least radius, as the axles then vary more from the direction of the radii. From this consideration, when taken alone, it would appear to be best to place the axles as near to each other as possible, thus causing them to approach more nearly to the direction of the radii of the curves and the planes of the wheels to conform to the line of the rails. There are, however, other circumstances which must not be overlooked in their construction.

I have already alluded to the increased force of the shocks from obstructions, at high velocities; and whatever care may be taken, there will be inequalities in the rails and wheels, which, though small are numerous, and the perpetual operation of which produces effects which cannot be disregarded. The greater the distance between the axles while the length of the body remains the same, the less is the influence of the shocks or concussions; and this has led, in many instances, to the placing them in passenger cars at or near their extreme ends. Now, however, a compromise is most commonly made between the evils resulting from a considerable separation and a near approach, as by the modes of construction now in use, one of the advantages must be sacrificed to the other. But it is not to the lateral curvature and inequalities of the road alone that the foregoing remarks apply. The incessant vibration felt in travelling over a railroad is mainly dependent upon the vertical motion of the cars, in surmounting those numerous though minute obstructions which unavoidably exist. The nearer the axles are placed to each other the greater is the effect of this motion upon the passengers, and the greater its power to derange the machinery and the road. It becomes very important, therefore, both as regards comfort, safety, and economy, to devise a mode of combining the advantages de-

rived from placing the axles at a considerable distance apart, with those of allowing them to be situated near to each other.

It has been attempted, and with some success, to correct the tendency of the flanges to come in contact with the rails on curved and other parts of the road, by making the tread of the wheel conical; and if the travelling upon railroads was not required to be very rapid, this would so far prove an effectual corrective, as the two rails would find diameters upon the wheels which would correspond with the difference in length, the constant tendency to deviation being as constantly counteracted by this construction; but at high velocities the momentum of the body in motion tends so powerfully to carry it in a right line as to cause the wheel on the longer rail to ascend considerably above that part of the cone which corresponds therewith. The consequence of this is, a continued serpentine motion, principally but not entirely in a lateral direction. Nor is this confined to the curved parts of the road, but it exists, to an equal or greater extent, upon those which are straight, especially when the axles are near to each other—the irregularities before spoken of constantly changing the direct course of the wheels, whilst there is no general curvature of the rails to counteract it. To avoid this effect and the unpleasant motion and tendency to derangement consequent upon it, an additional motive is furnished for placing the axles at a considerable distance apart.

The object of my invention is, among other things, to make such an adjustment or arrangement of the wheels and axles as shall cause the body of the car or carriages [?] to pursue a more smooth, even, direct, and safe course, than it does as cars are ordinarily constructed, both over the curved and straight parts of the road, by the before mentioned desideratum of combining the advantages of the near and distant coupling of the axles, and other means to be hereinafter described. For this purpose I construct two bearing carriages, each with four wheels, which are to sustain the body of the passenger or other cars, by placing one of them near each end of it, in a way to be presently described. The two wheels on either side of these carriages, and to be placed very near to each other, the space between their flanges need be no greater than is necessary to prevent their contact with each other. These wheels I connect together by means of a very strong spring, say double the usual strength employed for ordinary cars, the ends of which springs are bolted or otherwise secured to the upper sides of the boxes, which rest on the journals of the axles, the longer leaves of the springs being placed downwards, and surmounted by the shorter leaves. Having thus connected two pairs of wheels together, I unite them into a four-wheel bearing carriage, by means of their axles and a bolster of the proper length extending across between the two pairs of wheels, from the centre of one spring to that of the other, and securely fastened to the tops of them. This bolster must be of sufficient strength to bear a load upon its centre of four or five tons. Upon this first bolster I place another of equal strength, and connect the two together by a centre pin or bolt passing down through them, and thus allowing them to swivel or turn upon each other in the manner of the front bolster of a common road waggon. I prefer making these bolsters of wrought or cast iron; wood, however, may be used. I prepare each of the bearing carriages in precisely the same way. The body of the passenger or other car



I make double the ordinary length of those which run on four wheels, and capable of carrying double their load. This body I place so as to rest its whole weight upon the two upper bolsters of the two before-mentioned bearing carriages or running gear; I sometimes place these bolsters so far within the ends of the body of the car, as to bring all the wheels under it, and in this case less strength is necessary in the car body than when the bolster is situated at its extreme ends. In some cases, however, I place the bolster so far without the body of the car, at either end, as to allow the latter to hang down between the two sets of wheels or bearing carriages, and to run, if desired, within a foot of the rails. When this is done, a strong iron frame-work projects out from either end of the car or carriage body, and rests upon the upper bolsters of the two bearing carriages.

This last arrangement, by which the body of the car is hung so low down, manifestly affords a good security to the passengers, exempting them, in a great degree, from those accidents to which they are liable, when the load is raised. Several bodies may be connected or rest on a common frame, and be supported on the bearing carriages, in a manner similar to that of a single body. When the bolsters of the bearing carriages are placed under the extreme ends of the body, the relief from shocks and concussions, and from lateral vibrations, is greater than it is when the bolsters are placed between the middle and ends of the body, and this relief not materially raised by increasing or diminishing the length of the body, while the extreme ends of it continue to rest on the bolster of the bearing car; the loads being supposed to be equally distributed over the entire length of the body. Although I prefer the use of a single spring to a pair of wheels, as above described, instead of the ordinary spring to each wheel, and consider it as more simple, cheap, and convenient than any other arrangement; the end which I have in view may, nevertheless, be obtained by constructing the bearing carriages in any of the modes usually practised, provided that the fore and hind wheels of each of them be placed very near together; because the closeness of the fore and hind wheels of each bearing carriage, taken in connection with the use of two bearing carriages coupled remotely from each other as can conveniently be done for the support of one body, with a view to the objects and on the principles hereinbefore set forth, is considered by me a most important feature of my invention; for by the contiguity of the fore and hind wheels of each bearing carriage, while the two bearing carriages may be at any desirable distance apart, the lateral friction from the rubbing of the flanges against the rails is most effectually avoided, whilst at the same time all the advantages attendant upon placing the axles of a four-wheeled car far apart, are thus obtained. The bearing of the load, are [on ?] the centre of the bolster, which also is the centre of each bearing carriage, likewise affords great relief from the shocks occasioned by the percussion of the wheels of [on ?] protuberant parts of the rails or other objects, and from the vibrations consequent to the use of cone wheels; as the lateral and vertical movements of the body of the car, resulting from the above causes, are much diminished.

The two wheels on either side of one of the bearing carriages may, from their proximity, be considered as acting like a single wheel; and as these two bearing carriages may be placed at any distance from each

other consistent with the required strength of the body of the car, it is evident that all the advantage is obtained which results from having the two axles of a four-wheeled car at a distance from each other, whilst its inconveniences are avoided.

Another advantage of this car compared with those in common use, and which is viewed by me as very important, is the increased safety afforded by it to passengers, not only from the diminished liability to breakage or derangement in the frame work, but also from the less disastrous consequences to be apprehended from the breaking of a wheel axle or other part of the running gear, as the car body depends for its support and safety upon a greater number of wheels and bearing points on the road.

I do not claim as my invention the running of cars or carriages upon eight wheels, this having been previously done; not, however, in the manner or for the purpose herein described, but merely with a view of distributing the weight carried, more evenly upon a rail or other road, and for objects distinct in character from those which I have had in view, as herein set forth; nor have the wheels, when thus increased in number, been so arranged and connected with each other, either by design or accident, as to accomplish this purpose.

What I claim, therefore, as my invention, and for which I ask a patent, is the before described manner of arranging and connecting the eight wheels which constitute the two bearing carriages, with a railroad car, so as to accomplish the end proposed by the means set forth, or by any others which are analogous and dependent upon the same principles.\*

ROSS WINANS.

Witnesses—G. BROWN,

JNO. H. B. LATROBE.

As by the said letters patent in Court to be produced will more fully appear, which said letters patent were duly extended for a period of seven years from and after the first day of October, 1848, under the statutes in such case made and provided, so that the said letters patent now have the same effect in law as though the same had been originally granted for the term of twenty-one years. And the Plaintiff further says, that from the time of the granting and delivering to him of the said letters patent and the extension thereof, hitherto, he has made, used, and vended to others to be used, the said invention, to his great advantage and profit. Yet the said Defendant, well-knowing the premises, but contriving to injure the Plaintiff, did, on the first day of January, 1849, and at divers times before and afterwards, during the said term of twenty-one years mentioned in said letters patent, and before the purchase of this summons, at the city of New York, to wit: at the city and county of New York, in said Southern District of New York, unlawfully and wrongfully, and without the consent or allowance, and against the will of the Plaintiff, make and use the said invention, in violation and infringement of the exclusive right, so secured to the Plaintiff, by the grant and delivery to him of the said letters patent, and contrary to the form of statutes of the United States in such case made and provided, whereby the Plaintiff has been greatly injured and

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\* For drawing see drawing annexed.

deprived of great profits and advantages which he might and otherwise would have derived from said invention, and has sustained actual damage to the amount of ten thousand dollars; and by force of the statutes aforesaid, an action has decreed [accrued ?] to him to recover the said actual damage and such additional amount, not exceeding in the whole three times the amount of such actual damage as the Court may see fit to order and adjudge; yet the said Defendant though requested, has not paid the same or any part thereof, to the Plaintiff, but hath refused and yet refuses so to do.

GEORGE G. SICKLES,

*Plaintiff's Attorney*, 79 Nassau Street.

*Plea.*

C. W. Sandford, Defendant's Attorney.

Filed, March 20, 1849.

CIRCUIT COURT OF THE UNITED STATES FOR THE SOUTHERN  
DISTRICT OF NEW YORK.

THE NEW YORK AND HARLEM RAILROAD COMPANY, *ads'm.* ROSS WINANS.

And the said The New York and Harlem Railroad Company, Defendants in this suit, by Charles W. Sandford, their attorney, come and defend the wrong and injury there, &c., and say that they are not guilty of the said supposed grievances above laid to their charge, in manner and form as the said Plaintiff hath above thereof complained against them, &c.; and of this they, the said Defendants, put themselves upon the country; and the said Plaintiff doth the like, &c.

CHARLES W. SANDFORD, *Attorney for Def'ts.*

UNITED STATES CIRCUIT COURT, COMMON LAW DOCKET.

ROSS WINANS. [GEORGE G. SECKLES,] *vs.* THE HARLEM RAILROAD COMPANY.

[GEO. SANDFORD.]

1849. January 12.	Scaled capias.
“ 16.	Filed summons, P. S. on President of Co.
“ 17.	“ precipe and entered app. of Def'ts, by C. W. Sandford.
February 6.	“ nar. and ent'd rule,
March 19.	“ note of issue. Jury,
“ 20.	“ plea of Defendant,
October 6.	“ note of issue,
1851. April Term.	“ “ “
Oct. Term.	“ “ “
1852. April Term.	“ “ “
April 5.	“ consent that cause go off for the term.

All of which we have caused by these presents to be exemplified and the seal of the said Circuit Court to be heretofore affixed.

Witness, the Honorable Roger B. Taney, Chief Justice of the Supreme Court of the United States, at the City of New York, this twelfth day of April, in the year of our Lord one thousand eight hundred and fifty-four, and of the Independence of the United States the seventy-eighth.

JOHN W. NELSON, *Clerk.*

I, Samuel R. Betts, one of the Judges of the Circuit Court of the United States for the Southern District of New York, in the Second Circuit, do hereby certify that the foregoing exemplification is in due form of law.

SAMUEL R. BETTS.

### RESPONDENT'S EXHIBIT, No. 3.

#### RECORD.

ROSS WINANS *vs.* THE NEWCASTLE AND FRENCHTOWN TURNPIKE AND RAILROAD COMPANY.

#### THE UNITED STATES OF AMERICA.

DISTRICT OF MARYLAND, TO WIT :

At a Circuit Court of the United States, for the Fourth Circuit, in and for the Maryland District, begun and held at the City of Baltimore, on the first Monday in November, in the year of our Lord one thousand eight hundred and thirty-nine.

Present—The Honorable R. B. Taney, Chief Justice of the Supreme Court of the United States ; U. S. Heath, Judge of Maryland District ; Nathaniel Williams, Esquire, Attorney ; Nicholas Snider, Esquire, Marshal ; Thomas Spicer, Clerk.

Among others were the following proceedings, to wit :

ROSS WINANS *vs.* THE NEWCASTLE AND FRENCHTOWN TURNPIKE AND RAILROAD COMPANY.

Be it remembered, that heretofore, to wit, on the sixteenth day of July, in the year of our Lord one thousand eight hundred and thirty-eight, the said Ross Winans, by John H. B. Latrobe, his attorney, prosecuted and sued forth, out of the Circuit Court here, the writ of the United States of America, of *capias ad respondendum*, directed to the Marshal of the Maryland District aforesaid, in the words and of the tenor following, to wit :

#### THE UNITED STATES OF AMERICA.

DISTRICT OF MARYLAND, TO WIT :

To the Marshal for the Maryland District, Greeting.

[L. S.] We command you that you summon the Newcastle and Frenchtown Turnpike and Railroad Company, a body corporate, duly constituted and established by an Act of the General Assembly of Maryland, passed at its December Session, in the year eighteen hundred and twenty-seven, if they shall be found in your District, that, all excuses and delays set aside, they be and appear before the Circuit Court of the United States, for the Fourth Circuit, in and for the Maryland District, at the United States Court Room, to be held at the City of Baltimore, on the first Monday in October next, to answer unto Ross Winans, of the City of Baltimore, in the State of Maryland, in a plea of trespass on the case. Hereof you are not to fail, at your peril ; and have you then and there this writ. Witness, the Honorable Roger



B. Taney, Chief Justice of our Supreme Court, the second Monday in January, in the year of our Lord one thousand eight hundred and thirty-eight.

J. H. B. L. Issued, 16th July, 1838.

THOS. SPICER, *Clerk Circuit Court.*

And the said Ross Winans, by his Attorney aforesaid, on the day of prosecuting and suing forth of the aforesaid writ, declared against the said Newcastle and Frenchtown Turnpike and Railroad Company, in the plea aforesaid, in form following, to wit :

*Declaration.*

CIRCUIT COURT OF THE UNITED STATES, FOR THE FOURTH CIRCUIT,  
IN AND FOR THE MARYLAND DISTRICT.

DISTRICT OF MARYLAND, TO WIT :

The Newcastle and Frenchtown Turnpike and Railroad Company, a body corporate, duly constituted and established by an Act of the General Assembly of Maryland, passed at its December Session, in the year eighteen hundred and twenty-seven, were summoned to answer unto Ross Winans, of the City of Baltimore, in the State of Maryland, in a plea of trespass on the case—

For that whereas the Plaintiffs [?] before and at the time of making the letters patent, as hereinafter mentioned, was the true and original inventor of a new and useful improvement in the construction of cars or carriages intended to run upon railroads, to wit, at the District aforesaid ; and thereupon, heretofore, to wit, on the first day of October, in the year eighteen hundred and thirty-four, upon the application of the Plaintiff, the Secretary of State of the United States caused letters patent to be issued in the name of the United States, bearing date, Washington, the day last aforesaid, under the seal of the United States, and duly tested, according to the form of the statute in such case made and provided, wherein and whereby was granted to the Plaintiff, his heirs, administrators, and assigns, for the term of fourteen years from the said first day of October, in the year eighteen hundred and thirty-four, the full and exclusive right and liberty of making, constructing, using and vending to others to be used, the said new and useful improvement, agreeably to the statute of the United States, made and passed on the twenty-first day of February, in the year of our Lord one thousand seven hundred and ninety-three, entitled, "An act to promote the progress of the useful arts, and to repeal the act heretofore made for that purpose," and the statute of the United States passed on the seventeenth day of April, in the year of our Lord one thousand eight hundred, entitled, "An act to extend the privilege of obtaining patents for useful discoveries and inventions to certain persons therein mentioned, and to enlarge and define the penalties for violating the rights of patentees," as by the said letters patent here in Court to be produced (reference being had thereunto for a specification of the aforesaid improvement,) will more fully appear.

And the Plaintiff further says, that the said Plaintiff did always, from the time of making and granting the said letters patent, as aforesaid, exercise and enjoy the right, privilege and liberty aforesaid, to wit, at the District aforesaid, and has exercised, used, and enjoyed the

same right and liberty, to the day of the purchase of this writ, by himself and his servants and deputies, to his great profit and advantage, to wit, at the county aforesaid.

Yet the said Defendants, well knowing the premises, but contriving and wrongfully and injuriously intending to injure the Plaintiff, and to deprive him of the profits, benefit, and advantages which he might and would otherwise have derived and acquired from the exclusive making, using, and vending the aforesaid new and useful improvement, after the making of the said letters patent, and within the term of years in the said letters patent mentioned, to wit, at the county aforesaid, on the first day of January, in the year eighteen hundred and thirty-five, and at divers other days and times, and every day between that day and the day of the purchase of this writ, did make, devise, and use the said new and useful improvement, unlawfully and unjustly, without the permission or license in writing, but against the will of the Plaintiff, in breach of the aforesaid letters patent, and in violation and infringement of the right and privilege and liberty so as aforesaid granted to the said Plaintiff, and contrary to the form and effect of the statute aforesaid, in such case made and provided; whereby the Plaintiff hath been, and is, greatly injured and deprived of great profits, which he otherwise might and would have derived and acquired from the said new and useful improvement.

And the said Ross Winans, the Plaintiff aforesaid, further says, that the said Newcastle and Frenchtown Turnpike and Railroad Company, the Defendants aforesaid, well knowing the premises, but contriving and wrongfully and injuriously intending to injure the Plaintiff, and deprive him of the profits, benefits, and advantages which he might and otherwise would have derived and acquired from the exclusive using, making, and vending the aforesaid new and useful improvement, after the making of the said letters patent, and within the term of years in the aforesaid letters patent mentioned, to wit, at the county aforesaid, on the first day of January, in the year eighteen hundred and thirty-five, and at divers other days and times, and every day between that day and the day of the purchase of this writ, having previously made or caused to be made, did use the said new and useful improvement, unlawfully and unjustly, without the permission or license in writing, but against the will of the Plaintiff, in breach of the aforesaid letters patent, and in violation and infringement of the right, privilege, and liberty so as aforesaid granted to the Plaintiff, and contrary to the form and effect of the statute aforesaid, in such case made and provided. Whereby the Plaintiff hath been and is greatly injured, and deprived of great profits, which he otherwise might and would have derived from the said new and useful improvement. Whereupon the said Plaintiff says he hath damage and is worse, to the value of ten thousand dollars, wherefore he brings suit.

JNO. H. B. LATROBE, *Plffs Attorney.*

TO THE DEFENDANTS:

Take notice, that the trial of the within suit will be pressed at the November term ensuing the date hereof, of the Circuit Court, under the rule passed at April Term, 1838.

JNO. H. B. LATROBE, *for Plaintiff.*

A copy of which said declaration was made and sent with the said writ to the Marshal of the Maryland District aforesaid, thereon endorsed, "Case, copy nar and notice to be served on the Defendants with the writ."

At which mentioned first Monday in November, in the year of our Lord one thousand eight hundred and thirty-eight, being the day of the return of the aforegoing writ, comes into the Circuit Court here, the said Ross Winans, by his attorney aforesaid; and the Marshal of the Maryland District aforesaid, to wit: Nicholas Snider, Esquire, gentleman, to whom the said aforegoing writ was in form aforesaid directed, makes return thereof to the Court here thereon endorsed, to wit:

*Marshal's Return.*

"Cepi, 18th July, 1838, Hugh McElderry, and Samuel McDonald. Cepi, 19 July, 1838, Wm. McDonald.

"JOHN ZELL, *Deputy Marshal.*"

And the said Newcastle and Frenchtown Turnpike and Railroad Company, being called, appear in Court here, by John Glenn and John V. L. McMahon, their attorneys.

*Rule Plea.*

And thereupon, on motion of the said Ross Winans, by his attorney aforesaid, it is ruled by the Court here, that the said Newcastle and Frenchtown Turnpike and Railroad Company answer to the declaration aforesaid, of the said Ross Winans, in the plea aforesaid, or judgment by the Court here will be entered against them in default thereof.

*Plea, not guilty.*

And the said Newcastle and Frenchtown Turnpike and Railroad Company, by their attorneys aforesaid, defend the force and injury, when and so forth, and say that they are not guilty of the said supposed trespass above laid to their charge, in manner and form as the said Plaintiff hath above complained against them, and of this they put themselves upon the country, and the said Ross Winans in like manner, &c.

Thereupon further process of and upon the premises aforesaid, between the parties aforesaid, is by order of the Court here continued until the first Monday in April next, the costs of the Term to be paid by the said Newcastle and Frenchtown Turnpike and Railroad Company.

At which said first Monday in April, in the year of our Lord one thousand eight hundred and thirty-nine, came again into the Circuit Court here, as well the said Ross Winans by his attorney aforesaid, as the said Newcastle and Frenchtown Turnpike and Railroad Company by their attorneys aforesaid. And the said Newcastle and Frenchtown Turnpike and Railroad Company, by their attorneys, file in the Circuit Court here a notice to the said Ross Winans, in the words following, to wit:

*Notice of Special Matter in evidence.*

Winans v. The Newcastle and Frenchtown Turnpike and Railroad Company and . . . Notice of Special Matter to be given in evidence under general issue.

I shall prove by Mr. Dorsey that the eight-wheel cars were in use on the road of the Defendants before your patent. I shall prove by J. Trimble that you are not the original inventor of the eight-wheel car.

J. GLENN.

To J. H. B. LATROBE, *Counsel for Plaintiff.*

Whereupon, for trying the issue aforesaid, let a Jury thereon appear before the Court here immediately, by whom, &c., and who neither, &c., to recognize, &c., because as well, &c.

Thereupon it is ordered by the Court here that twenty persons from the panel of petit jurors, returned to the Court here by the Marshal of the Maryland District aforesaid, be drawn by ballot; and thereupon the said twenty persons being so drawn by ballot and written upon two lists, one of which said lists is delivered to the Counsel for the respective parties, and the Counsel for each of the said parties having stricken out four persons from the said lists, thereupon the remaining twelve persons being called come, to wit:

*Jury.*

Basil S. Elder, John P. Hooper, Robert Gover, Jacob D. Hare, Dudley Poor, John Robinson, William H. Hanson, Andrew Armstrong, Matthew McCollurn, Benjamin Hutchins, George Hayne, Thomas H. Belt, who were empaneled and sworn to say the truth in the premises.

And it appearing to the Court here that the jurors aforesaid, empannelled and sworn to try the issue aforesaid, are unable to agree upon a verdict, it is, with the consent of the said parties, by their attorneys aforesaid, ordered by the Court here that the Jurors aforesaid be wholly discharged from giving any verdict of and upon the premises aforesaid.

Thereupon, further process of and upon the premises aforesaid, between the parties aforesaid, by order of the Court here thereon, is further continued until the first Monday in November next.

At which said first Monday in November, in the year of our Lord one thousand eight hundred and thirty-nine, come again in the Circuit Court here, as well the said Ross Winans, by his attorney aforesaid, as the said Newcastle and Frenchtown Turnpike and Railroad Company, by their attorney aforesaid. And the parties aforesaid, by their attorneys aforesaid, file in the Circuit Court here an order in the words following, to wit:

*" Order to enter Judgment.*

" Ross Winans vs. the Newcastle and Frenchtown Turnpike and Railroad Company. U. S. Circuit Court. Action for breach of patent right.

" MR. SPICER: Enter judgment in this case for the damages laid in the declaration; to be released on payment of five hundred dollars.

JNO. H. B. LATROBE, *for Plff.*  
J. GLENN, *for Def't.*"



*Judgment.*

Therefore, it is considered by the Court here, that the said Ross Winans recover against the said Newcastle and Frenchtown Turnpike and Railroad Company, the sum of ten thousand dollars, current money, for his damages, so as aforesaid confessed; also the sum of

for his costs and charges, by him about his suit in this behalf expended, to the said Ross Winans, by the Court now here, with his assent adjudged: And the said Newcastle and Frenchtown Turnpike and Railroad Company, in mercy, &c.

*Memorandum.*

Judgment confessed in this cause on the 4th day of November, 1839, for the damages laid in the declaration, and costs of suit. The said damages to be released on payment of \$500.

And now here, at this day, to wit, the fourth day of November, in the year of our Lord one thousand eight hundred and thirty-nine, the said Ross Winans, by his attorney aforesaid, files in the Circuit Court here an order to enter the above judgment satisfied, in the words following, to wit.:

“MR. SPICER: Enter the within judgment satisfied.

“J. H. B. LATROBE, for Plff.”

Ross Winans vs. the Newcastle and Frenchtown Turnpike and Railroad Company. Circuit Court, November Term, 1839.

*Court's Instructions to the Jury, by Chief Justice R. B. Taney.*

1. According to the true construction of the Plaintiff's patent, he claims to be the first inventor of a car with eight wheels, arranged and connected in the manner and acting upon the principles stated in his specification, the object of which is to make such an adjustment or arrangement of the wheels and axles as shall cause the body of the car to pursue a more smooth, even, and direct and safe course, both over the curved and straight parts of a railroad. He does not claim to be the inventor of the eight-wheel car, nor does he claim to be the discoverer of the effect produced by the near and the more remote position of the wheels of an ordinary four-wheeled railroad car. Neither does he claim to be the inventor of a car body, either for burthen or for passengers, of a new or peculiar construction. Nor of any new manner of fixing the car to the steam engine, or other power, by which it is to be drawn along the road. But he claims as his invention the manner of arranging and connecting the eight wheels, as specified in his patent, for the end above mentioned. And, also, the connection of a railroad carriage body with them, adapted either to the transportation of merchandise or of passengers.

2. The two bearing carriages, mentioned in his specification, and the other elements which form portions of the machine which he claims to have invented, being well known and in common use, it was unnecessary to describe particularly the mode of their construction, and, as he specifies what he claims as new, every other mechanical principle or combination which he mentions in his specification, and which form component parts of the machine of which he claims to be the inventor, must, by necessary implication, be considered as admitted to be old, or

in use before; and the patent, therefore, is not invalid, because he has not, in express words, stated them to be old, nor described the manner of their construction.

3. The Plaintiff has not filed in the Patent Office, a disclaimer of any part of the thing patented as new, according to the Act of Congress of March 3d, 1837, and he still claims in this suit to be the first inventor of every thing claimed as new in his patent. If, therefore, the specification herein contained is too broad, and if he there claims to be the first inventor of any improvement or combination which was known and publicly used before, he is not entitled to recover in this action, although some substantial part of the machine, or some new combination of mechanical powers, described in the patent, may have been first invented or discovered by him.

4. The Plaintiff having claimed, in his specification, as his invention, the manner of arranging and connecting the eight wheels of a railroad carriage, in the manner mentioned in his patent, for the purpose of enabling burthen and passenger cars to pursue a more smooth, even, and safe course over the curves and irregularities of a railroad, he is not entitled to recover, if the jury find from the evidence that, before the time when the Plaintiff claims to have made this discovery, carriages with eight wheels arranged and connected substantially in the same manner, and upon the same mechanical principles, with those described by the Plaintiff, in his patent, were known and had been publicly used, for the purpose of transporting long timber more smoothly, evenly, and safely over the curves and irregularities of a railroad than could be done in cars of the ordinary construction with four wheels. And the circumstance that these timber cars were used only for temporary purposes, and were formed by using two ordinary four-wheel cars, with the hind and fore wheels close together, as bearing carriages, and without any car body upon them, cannot affect the question now before the Court.

5. If the same combination of the four wheels of each bearing carriage, and the same manner of arranging and connecting the two bearing carriages, and the coupling them remotely together, by means of the under and upper holsters, described in the Plaintiff's specification, was in use for the conveyance of timber on the Baltimore and Ohio Railroad, or elsewhere, before the time when the Plaintiff claims to have made this invention; and if the Plaintiff, without the introduction of any new principle or combination in the manner of arranging and connecting the wheels, or any substantial alteration in that respect, applied the same arrangement and connection of the wheels to the construction of cars or other carriages of eight wheels, intended to run on railroads, he is not entitled to recover. Because the application of an old machine to a new use, without any substantial change in its principles or construction or mode of operation, does not entitle the party to a patent.

6. It is admitted that the car Columbus, of eight wheels, was put upon the Baltimore and Ohio Railroad, on the 4th of July, 1831; and at the time the said car was constructed and put upon the road, the said agreement, mentioned in the testimony of Philip E. Thomas, was in force; and the Plaintiff was then in the service of the Company, performing the duties assigned to him by that agreement. It is also admitted that the car Winchester was put upon the road in March, 1834; the Comet, in the summer of the same year; and the Dromedary, in the month of

August of the same year, each of them being eight-wheel cars; and that, at the time the said three last mentioned cars were constructed and placed upon the road, the Plaintiff was in the service of the Company. That the written agreement of the 11th of February, 1834, between Plaintiff and the said Baltimore and Ohio Railroad Company, which has been offered in evidence, was executed on the day it bears date. It is also admitted that the said four cars, from the time they were placed on the road until the date of the Plaintiff's application for his patent, were used by the Company, from time to time, for the transportation of passengers, in the ordinary business of the Company. If the Jury find, from the evidence, that the manner of arranging and connecting the eight wheels, which constituted the bearing carriages of these four cars, with a railroad car, was substantially the same with that described in Plaintiff's patent, he is not entitled to recover, because the invention claimed by him was known and in public use, with his acquiescence, before the time of his application for a patent. The Court being of opinion that the Act of the 3d of March, 1839, entitled, "An Act in addition to an Act to promote the progress of useful arts," applies to patents issued subsequently to its passage, and does not apply to the case before the Court.

#### THE UNITED STATES OF AMERICA.

DISTRICT OF MARYLAND, TO WIT:

I, Thomas Spicer, Clerk of the Circuit Court of the United States for the Fourth Circuit, in and for the Maryland District, do hereby certify that the foregoing are true copies of the originals on file, among the record and proceedings of the Circuit Court aforesaid.

In testimony whereof, I hereunto subscribe my name, and affix the seal of the said Circuit Court, this twelfth day of April, in the year of our Lord, one thousand eight hundred and fifty-three.

THOMAS SPICER, *Clerk Circuit Court.*

The United States of America, District of Maryland, to wit: In the Circuit Court, November Term, 1839. *Ross Winans vs. The Newcastle and Frenchtown Turnpike and Railroad Company.*

Case nar. and notice filed, 16th July, 1838; copies sent, J. G. and J. V. L. M. M., app. Rule Plea, non cul, and issue, and cont'd by order of Court, costs of the Term to the Defendants, March 21st, 1839. Depo'n filed, April 11th, 1839. Notice filed, April 23d, 1839. Jury sworn, May 14th, 1839. The Jury being unable to agree on a verdict, were by consent of parties and by order of Court discharged, and cause continued by consent. November 4th, 1839, Judgment by confession, for the damages in the nar. To be released on payment of five hundred dollars. November 4th, 1839, Satisfied, says Plaintiff's Attorney. Order filed.

#### THE UNITED STATES OF AMERICA.

DISTRICT OF MARYLAND, TO WIT:

I, Thomas Spicer, Clerk of the Circuit Court of the United States, for the Fourth Circuit, in and for the Maryland District, do hereby certify, that the foregoing is a true copy of the docket entries in the above case.

In testimony whereof I hereunto subscribe my name and affix the seal of the said Circuit Court, this twelfth day of April, in the year of our Lord one thousand eight hundred and fifty-three.

THOMAS SPICER, *Clerk Circuit Court.*

#### THE UNITED STATES OF AMERICA.

I, Roger B. Taney, Chief Justice of the Supreme Court of the United States, and presiding Justice of the Circuit Court of the of the (?) United States, for the Fourth Circuit, in and for the Maryland District, do hereby certify that the foregoing attestation, by Thomas Spicer, Clerk of the said Circuit Court, is in due form. Given under my hand and seal, this third day of March, in the year of our Lord one thousand eight hundred and fifty-four.

R. B. TANEY.

#### RESPONDENT'S EXHIBIT, No. 4.

#### OUTSIDE DIMINISHED BEARING.

#### THE UNITED STATES PATENT OFFICE.

TO ALL PERSONS TO WHOM THESE PRESENTS SHALL COME, GREETING :

This is to certify, that the annexed is a true copy from the files of this office.

In testimony whereof, I, Charles Mason, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this twenty-eighth day of December, in the year of our Lord one thousand eight hundred and fifty-three, and of the independence of the United States the seventy-eighth.

C. MASON.

#### TO THE COMMISSIONER OF PATENTS :

The petition of Ross Winans, of the city of Baltimore, in the State of Maryland, engineer and machinist, respectfully represents :

That he did, on the 20th July, in the year 1831, obtain letters patent of the United States, for an improvement in the construction of *the axles or bearings of railway carriages* ; that, owing to circumstances not under his control, he has failed to obtain a reasonable remuneration for the time and expense bestowed in bringing the invention to perfection, and introducing it into public use ; that the utility of his invention is acknowledged by every one conversant with the subject of engineering ; as applied to conveyance on railroads, and that he does not doubt, that, by the extension of the term of his patent for seven years after the expiration of that for which it was originally granted, he shall be able to obtain that recompense to which he believes himself justly entitled. He, therefore, prays that his claim to such extension may be duly presented to the Board appointed for that purpose ; he having paid forty dollars into the treasury of the United States, and having hereunto also annexed a statement of the ascertained value of his invention, and of his receipts and expenditures thereon, so far as the nature of the case admits. All of which is respectfully submitted.

ROSS WINANS.



I, Ross Winans, of the city of Baltimore, in the State of Maryland, do declare and say, that the annexed account exhibits a just and true statement of the receipts and expenditures, on account of sales of the invention therein mentioned, and also a statement of the ascertained value of said invention, appended thereto. ROSS WINANS.


*Expenses incurred by ROSS WINANS, in relation to the Outside Diminished Journal, or Axle, for railway carriages, for which he obtained a patent on the 20th day of July, A. D. 1831.*

1831. July,	Fee paid at the Patent Office,	\$30 00
	Expenses attending the procuring of the patent, including specification, drawings, model, &c., about	50 00
	Fee paid Wm. Wirt, Esq., retainer, and for advice when about selling said patent, with others, to the Baltimore and Ohio Railroad Company, \$100—	
	one half chargeable to outside bearing patent,	50 00
1834. June 20,	Fee paid Daniel Webster, Esq., retaining fee, and for examining depositions, and written opinion in relation to outside bearing case,	100 00
“ May,	Expenses of self to Boston, for the purpose of settling or receiving compensation from the several roads there using my outside bearing patent; during which visit I spent several weeks, to enable Mr. C. G. Loring to examine fully into the validity of my claim, and to make an extended written opinion on the case,	100 00
“ Nov.	Expense of depositions procured in Baltimore, to enable Mr. Loring to further investigate my claim; and personal expenses in Boston at this time, in urging my claim on the several roads there,	75 00
1835. Feb.	Expenses in Boston, travelling and personal, during two weeks, spent at this time, in urging my claim,	75 00
“ May,	Expenses to Boston, at this time, and incurred there, in prosecuting claim against Boston and Providence Railroad Co.; for this purpose had a bill for injunction of some 40 to 50 pages drawn up,	100 00
	Fee paid E. G. Loring, Esq., for preparing bill for injunction, and professional services in injunction case,	100 00
	Fee paid J. Mason, Esq., of Boston, for advice in injunction case,	50 00
“ June,	Expense of commission executed in Baltimore, to take testimony to be used in case against Boston and Providence Railroad Co.,	70 00
	Fee paid J. Hanan, Esq., for copy of testimony, taken under commission, to be sent to my counsel,	30 00
	Expense of procuring attendance of witnesses to give testimony before Commissioner,	20 00
	Postage on commission to Boston,	10 00
	Paid attendance of witnesses in Boston, at different times; and for travelling and personal expenses, and time,	110 00
	<i>Amount carried forward,</i>	<hr/> \$970 00

	<i>Amount brought forward,</i>	\$970 00
1836.	Paid John Elgar, for seeing witnesses, and getting written statements of testimony in England, in 1836,	250 00
1837. April,	Paid C. G. Loring, my counsel, cash,	100 00
1839.	Paid expenses of English commission, £37 14s. 4d.	182 54
	Paid other expenses attending commission,	25 00
	Paid E. G. Loring, Esq., attorney in the case,	50 00
	Paid expenses to and from Boston several times, during the pendency of the suit, to consult attorneys, and to get up testimony,	150 00
	Expenses attending the getting up of testimony, and preparing for trial, at several different times,	75 00
	Expense of models, and cost of transporting them to Boston, to be used on trial,	50 00
1843. Nov.,	Expenses going to and at Boston, and preparing for trial expected to come on 1st Nov., 1843. The trial was put off by the Court, to the 23d Nov. Expenses incurred from and to Boston, to prepare for trial on the 23d Nov., 1843,	150 00
	Paid to J. H. B. Latrobe, for preparing testimony in Baltimore, correspondence with counsel in Boston, and services at sundry times,	250 00
	Cash paid E. G. Loring (bill,) after trial,	300 00
	Cash paid E. G. Loring, " "	400 00
	Cost recovered by Defendants,	1,565 49
		<hr/> \$4,518 03

Cr.

By cash received from the Baltimore and Ohio Railroad Company, for the improvement,	\$2,500	
Do. from Lowell Railroad Company,	500	\$3,000 00

 To both these companies sales were made, which included the right under other patents; but the sum here credited is properly due to the invention of the Outside Diminished Bearing.

NOTE.—In the foregoing account, nothing is charged of which the deponent has not a knowledge sufficient to make him confident that it does not exceed the sum properly chargeable. Where fees and costs have been paid, there is of course no room for error. Where travelling expenses have been charged, it has not been possible for the deponent to be equally certain. All that he has been able to do, has been to put down his expenses at sums which he believes are in every case less than what he really expended. There is another class of expenses which this deponent has no means of accurately determining; they are those connected with the experiments made by him, in ascertaining the value of his invention as to practical utility. These were expenses occurring in a course of years, from day to day, small in amount at times, and then larger again; but of which no account was kept. They cannot have fallen short of \$500. This deponent, anxious to make a fair and full statement, appends this note to his account, with a view to his own satisfaction, as well as for the information of those who have to judge his pretensions to an extension of his patent.

ROSS WINANS.

*Ascertained Value.*

It has been ascertained that the diminution of friction or resistance to moving power, caused by using the outside diminished bearing, instead of the inside bearing previously used, all things being otherwise equal, is as 200 is to 240—say one sixth, or  $16\frac{66\frac{2-3}{100}}$ . See Wood on Railroads, pp. 246 and 249; also, Fifth Annual Report of Balt. and Ohio R. R. pp. 21, 22. It has also been ascertained that the cost of running a locomotive engine, for a year, varies between \$5,000 and \$8,000, according to the class and construction of the machine, including all charges. The cost of fuel, which varies, makes the expenses unequal, at different places; but experience has shown that \$6,000 is about a fair average, under all circumstances.

Applying these ascertained data to a particular road, with a view to get at a general rule to estimate the saving caused by using the outside diminished bearing, it is known, from the 18th Report of the Balt. and Ohio Railroad Company, that the number of miles run by its engineers was 537,352, in the year ending the 1st October, 1844, at a cost of \$112,662; which is at the rate of very near 21 cents per mile, run by each engine, drawing after it trains having the outside diminished bearing. Without the advantage of this invention, the data above set down show that one-fifth more motive power would be necessary, or, in other words, the cost of motive power per mile would be one-fifth greater, or rising 25 cents per mile run, which shows a saving of about four cents per mile, or a reduction of one-sixth the friction, according to Wood. This saving on the Baltimore and Ohio Railroad would be  $537,352 \times 4 = \$21,494.08$ , equivalent to a capital saved to that company alone of upwards of 350,000, at 6 per cent.

The above statement of ascertained facts shows that the ascertained value of the invention is equal to four cents per mile on each mile run by engines, in the performance of the duty ordinarily required by them, as ascertained by the experience of the Baltimore and Ohio Railroad. This road is 188 miles long; and the whole length of all the railroads in the United States, is 3,600 miles, as per the Railroad Journal. Supposing they average the same work as the B. and O. R. Road, upon similar grades, and with the same curves, a simple multiplication would show the sum actually saved by the use of the invention to be \$398,336, very nearly, per annum—a sum large, indeed, but supported on the data that I have given; any reasonable deduction from which gross sum would still leave a very great annual saving to the country, as the result of this invention.

NOTE. In the above estimate the saving is calculated upon data furnished by experience and authority, upon grades below twenty feet per mile; above that grade, and where there are curvatures in the road, the advantages, although still very great, are not to the same extent varying with the character of the grade and the curvature. With this explanation, the foregoing statement of the ascertained value will not mislead. Many of the railroads of the country have no grades exceeding twenty feet per mile, and few exceed that grade but for short distances; so that four cents, as above, per mile run, may be taken as the ascertained value of the invention, and considered as near the actual truth as the nature of the subject will permit us to approximate.

ROSS WINANS.

CITY OF BALTIMORE, SS. STATE OF MARYLAND.

On this 24th day of February, 1845, before the subscriber, a Justice of the Peace in and for said city, personally appeared the within named Ross Winans, and made solemn oath, that the foregoing statement of his receipts and expenditures in the matter to which it relates, and of the ascertained value of the invention mentioned therein is, as he verily believes, just and true.

Sworn before,

WILLIAM WARFIELD.

### RESPONDENT'S EXHIBIT, No. 5.

#### WINANS'S PETITION FOR EXTENSION OF PATENT.

##### THE UNITED STATES PATENT OFFICE.

TO ALL PERSONS TO WHOM THESE PRESENTS SHALL COME, GREETING:

This is to certify, that the annexed are true copies from the files of this office.

In testimony whereof, I, Charles Mason, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this twenty-eighth day of December, in the year of our Lord one thousand eight hundred and fifty-three, and of the Independence of the United States the seventy-eighth.

C. MASON.

*In the Matter of the Extension of certain Letters Patent issued to Ross Winans, October 1st, 1834.*

##### *Statement of Value.*

In the construction of all railroads in this country, it has been found necessary to admit of lateral curvatures in the line of track, the radii of which are sometimes but a few hundred feet; and it has become important, therefore, so to construct the cars, as to enable them to overcome the difficulties presented by such curvatures, and to adapt them for running with the least friction practicable upon all parts of the road. The friction to which I allude is that which arises from the contact between the flanges of the wheels, and the rails, injurious to both, and also reducing the effective power of the engine. The rapid speed at which trains conducted by locomotive engines now travel, causes a greater momentum of the load, increases the intensity of the shocks and concussions, from which the greatest number of accidents and amount of wear and tear on railroads arises, and renders it necessary that the form of cars, and certain features of construction and arrangement, should now receive special attention, but which were formerly disregarded as unimportant.

Previous to the adoption of this device, the passenger and other cars in general use on railroads, had but four wheels, the axles of which were placed from three and one half to five feet apart; the precise distance being governed by the nature of the road, and the special purpose for which the cars were intended. When the cars are so constructed that the axles retain their parallelism, and are at a considera-



ble distance apart, there is, when in motion, a constant tendency in the flanges of the wheels to come in contact with the rails, and to get off the track, especially on the quicker curves, as the axles then vary more from the direction of the radii. To correct the tendency of the flanges of the wheels to come in contact with the rails, particularly on curved parts of the road, the tread of the wheel is made conical; and if the speed of the travel was slow, this would prove corrective, as the two rails rails [?] would find diameters upon the wheels, which would correspond with the difference in length; but at high velocities, the momentum of the car tends so powerfully to carry it into a right line, as to cause the wheel on the longer rail to ascend considerably above that part of the cone which corresponds therewith. The consequence of this is a continued serpentine motion, principally, but not entirely, in a lateral direction. The incessant vibration, highly injurious to merchandise, and tiresome to travellers, observed and felt in travelling over railroads, is, however, mainly caused by the vertical motion of the cars in surmounting those numerous though minute obstructions, which unavoidably exist; and the nearer the axles are placed to each other, the greater is the effect of this motion upon the passengers, and the greater its power to derange the machinery and the road. On the other hand, the greater the distance between the axles while the length of the body remains the same, the less is the influence of those shocks and concussion; and this has led, in many instances, to the construction of four-wheel cars, with the wheels at the extreme ends, as on the straight roads of England, where the axles of a four-wheel car are often fourteen feet apart. The shocks, serpentine motion, and vibration, are greatly diminished in force and intensity by arranging the wheels on a "truck" independent of the car body, so as to permit them to adapt themselves to the peculiarities of the road, relieving the axles and body from strains, as well as the road from its great source of injury—a result which is new, peculiar, and confined to the device to which this statement has reference.

The disadvantages of placing the wheels either in close proximity or near the ends, and the disastrous and costly results arising from the use of the four-wheel car, were so apparent and serious as to lead engineers to seek for some mode by which the advantages of near and distant bearings on the road, with as few as possible of the disadvantages of either alone, should be obtained; and the experiment made by me towards the object resulted in the eight-wheel car, the object of which is to make such an arrangement of the wheels and axles as shall cause the body of the car to pursue a more smooth, even, direct and safe course, by means of the special arrangement and combinations particularly set forth in the specification annexed to the letters patent issued to me for the said invention, and which may be briefly stated thus:

For this purpose I construct two bearing carriages, called "trucks," each having four-wheels; the wheels on both sides of each are to be placed very near to each other; the space between them need not be greater than is necessary to prevent their flanges from coming in contact. These "trucks" sustain the car body on their central point, with intermediate bolsters, which turn on a swivel-pin or king-bolt;

the motive power attached to the car body allowing the free play of the trucks under it, unlike the fore-wheels of a common road waggon, which are guided by the tongue, and the body of the car made at convenience of double or treble the length of a body of the old four-wheel pattern. The eight-wheel car thus constructed has all the advantages of having the axles placed near together, as in the four-wheel car; with these it combines all the advantages of the distant position of the points of bearing of the wheels; to these may be added those arising from a free play of the trucks, independent, as far as lateral motion is concerned, of the car body, with such weight as may be added to it, *resulting in ease and smoothness of motion, diminution of friction, avoidance of strains and shocks to the road and cars, and also a diminution in the expense to the road and carriages; an increased safety to passengers, from the diminished liability of flying the track when in motion, to breakage, derangement in the frame work, and the disastrous consequences to be apprehended from the breaking of a wheel, axle, or any other part of running gear; as the car body depends for its support and safety upon a greater number of wheels and bearing points on the road;—a series of advantages so apparent and valuable that the eight-wheel car is now in general use, and of which, at the same time, it is impossible, from its nature, to form an estimate of its value in dollars and cents.*

ROSS WINANS.

CITY OF BALTIMORE, STATE OF MARYLAND, SS.

On this 9th day of August, 1848, before me, the subscriber, a Justice of the Peace, in and for the said city, personally appeared the within named Ross Winans, and made solemn oath that the forgoing statements, as to the matters therein contained relative to the value of the said invention, are, as he verily believes, just and true.

Sworn to before

A. H. PENNINGTON.

## RESPONDENT'S EXHIBIT, No. 6.

### ORDER OF NOTICE, EXTENSION OF PATENT.

PATENT OFFICE, JUNE 3, 1848.

On the petition of Ross Winans, of Baltimore, praying for the extension of a patent granted to him on the 1st October, 1834, for an "improvement in railway cars and carriages," for seven years from the expiration of said patent, which takes place on the first day of October, 1848: It is ordered that the said petition be heard at the Patent Office, on the third Monday of August next, (20th), at 12 o'clock, M.; and all persons are notified to appear and show cause, if any they have, why said petition ought not to be granted.

Ordered, also, that this notice be published in the Union, Intelligencer, and Democrat, Washington; Argus, Baltimore; Pennsylvanian, Philadelphia; True Sun and Sun, New York; Post, Boston; Gazette, Portsmouth, N. H.; Post, Pittsburgh; and Enquirer, Cincinnati; once a

week, for three successive weeks; the last publication whereof to be at least sixty days previous to the third Monday of August next.

EDMUND BURKE, *Com'r of Patents*.

P. S. Editors of the above papers will please copy, and send their bills to the Patent Office, with a paper containing this notice.

## RESPONDENT'S EXHIBIT, No. 7.

### MEREDITH'S LETTER.

EDMUND BURKE, ESQ., PATENT OFFICE, WASHINGTON.

Philadelphia, 10th August, 1848.

DEAR SIR—At the request of Mr. Ross Winans, I send you, herewith, the original patent granted to him, on the 1st October, 1834, for an improvement in the construction of cars or carriages, intended to run upon railroads.

With great respect, your obt. servt,

W. M. MEREDITH.

## RESPONDENT'S EXHIBIT, No. 8.

### COXE'S LETTER.

H. H. SYLVESTER, ESQ., *Chief Clerk Patent Office*.

SIR :—This being the day appointed upon adjournment for the hearing of the case on the application of Winans for an extension of his patent, on behalf of the Boston and Providence Railroad Company, which has an interest in the question, I appeared at the Patent Office this morning for the purpose of opposing the extension as asked by Mr. Winans. It had been my intention to oppose the extension upon various grounds: on account of the insufficiency of the application for it, no sufficient reasons being therein set forth; on account of the insufficiency of the testimony filed to support it; because such evidence, statements, and accounts as are required by the act of Congress, have not been furnished by the applicant or patentee; because it is not made to appear that, having due regard to the public interest therein, that the term of the patent should be extended, by reason of the patentee, without neglect or fault on his part, having failed to obtain, from the use and sale of his alleged invention, a reasonable remuneration for the time, ingenuity, and expense bestowed upon the same, and the introduction thereof into use. It had been my wish to urge these points before the Commissioner, upon the facts set forth in the papers filed by the patentee, and the affidavit filed by myself. I learned, however, from you, that the Commissioner was not in town, and was not expected back until the first of October, and that you designed to act in the case in his absence. Upon a careful examination of the law, it appears to me

that the very important duty confided by law to the Commissioner can be executed by himself alone, and cannot be delegated to another. The time prescribed for hearing the case will have elapsed, and a new application has become necessary.

Under these circumstances, and especially as the parties whom I represent in the matter have been prevented, by a succession of accidents, from presenting the evidence which it was wished to exhibit against Mr. Winans's application, I would respectfully submit the foregoing suggestions to your consideration, and hope that you will come to the conclusion that you have no jurisdiction in the matter; and that, if you have, the patentee has not made out a case warranting the granting of his application.

Very respectfully, yours, &c.,

RICH. S. COXE.

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### RESPONDENT'S EXHIBIT, No. 9.

#### WHISTLER'S AFFIDAVIT.

*In the matter of the Extension of certain Letters Patent, issued to Ross Winans, Oct. 1st, 1834.*

George W. Whistler, Jr., engineer, being duly sworn, doth declare : That he is familiar with railway machinery ; the means of transporting passengers and merchandize by the same ; and the relative efficiency of the four and eight-wheeled cars used for these purposes ; the principles upon which these cars are built ; as well, also, as the material difference between the eight-wheeled lumber car and eight-wheeled passenger car, patented by Ross Winans. That the eight-wheeled car, constructed with two trucks of four wheels each, and placed at or near the extreme ends of a car body, resting upon them, is greatly superior to the four-wheeled car, constructed with two pair of wheels, one at each end of the car body, parallel to and at limited distances from one another, there can be no question of, for experience and practice have led from the general use of the four-wheeled car to the almost exclusive use of the eight-wheeled car. The difference which he believes to exist between the eight-wheeled lumber car and eight-wheeled passenger car, can be best shown by stating the objects and manner of constructing each. The lumber car had for its object the greater ease in transporting very long lumber than could be had by placing it on two four-wheeled cars simply, and constructed without reference to being used in connection with one another. The manner by which this was done was to place upon each car a bolster or support, for the lumber, having a single bearing point, which was the centre of the support or bolster upon the car. The distance apart of these four-wheeled cars was determined by the length of the lumber they were required to carry, and also the necessity of placing them with a view of preventing the lumber from swagging. The power necessary to draw them over the road was applied to the perch of the four-wheeled



car, forming the support for the load, and not to the lumber, which might be considered, for illustration, in the place of the car body. The passenger car had for its object the safety, ease, and economy of transporting passengers at the increased speed which the improvements in locomotive engines sanctioned and the public demanded, over that attained by the use of the four-wheeled car. To construct a car which should combine all these advantages, necessarily required the entire abandonment of the four-wheeled car, as it was then used singly, or in combination with the eight-wheeled lumber car. With this view of the necessity for an entire new structure, two trucks were made, each having four wheels and two axles placed as close as practicable to one another, and each supporting an end of a long car-body, which rested upon a single point in the centre of the bolster upon the truck. These trucks were placed at or near the extreme ends of the car body; and not in reference to the length of car body. The power necessary to draw it over the road was applied to the car body, and through the centre points upon which it rested on the trucks. These were the objects and manner of constructing the eight-wheeled lumber and passenger cars. The first consisted in the application of the bolster to the ordinary four-wheeled cars, for the convenience and ease of transporting long lumber, while the second consisted in an entire new arrangement of the eight wheels into two short frames with their bolsters, called trucks, the separate axles and wheels of which were brought as close as practicable to one another, in order to present the least resistance in turning curves, by having the shortest possible length of rigid body. In this arrangement for each particular truck consisted the ability to move with safety and ease, over curved roads, at much greater velocities than had heretofore been attained. That such could not be the case with the lumber car, or a passenger car, constructed in the same manner, was evident from its having but the four-wheeled car under each end to support it, which had its limit to speed and safety on curved roads, and, therefore, could not form a part of the eight-wheeled passenger car, with its improvements.

Another and very striking difference between the lumber and passenger car, consisted in the manner by which they were drawn upon the road. The former, as I have said, was drawn by the perch of the four-wheeled car or truck, (as the four-wheeled car was by itself drawn upon the road,) while the great improvement in the passenger car consisted in drawing by the body of the car, and through its centres on the trucks, thus leaving the trucks free to take their position on the rails, and adapt themselves to the abrupt curvatures and inequalities of the road. The effect of drawing by the trucks would have been to make them follow the direction of the power applied, which is sometimes upon one side and sometimes upon the other, of the direction of the line of the road; this varying being greatest on the worst roads, and at all times rendering cars so drawn much more liable to fly the track. This difference in the mode of applying the power, I consider a very great one, and absolutely necessary to the safety of travelling.

One other difference between the lumber and passenger [?] I will point out, for it is an important one;—the position of the trucks under the passenger car as compared to the position of the four-wheeled cars, or trucks, under the lumber. The first is established by the knowledge

that the greatest distance these trucks can be placed apart, is that which will disturb the car the least, and give the greatest ease to passengers; while the second is a matter of necessity, growing out of the flexibility of long timber, and its requiring support somewhere about half way between the centre and its ends, to prevent its swagging, which would as effectually prevent any ease to car and passengers as the old four-wheeled car.

CITY OF BALTIMORE, STATE OF MARYLAND, SS.

On the 9th day of August, 1848, personally appeared before me, the subscriber, a Justice of the Peace in and for the said city, the within named George W. Whistler, Jr., made solemn oath that the foregoing statements relative to the matters therein contained, relative to railway carriages, are, as he verily believes, just and true.

Sworn before JAS. BUCHANAN.

## RESPONDENT'S EXHIBIT, No. 10.

### ELGAR'S AFFIDAVIT.

*In the Matter of the Application of Ross Winans, for an Extension of certain Letters Patent, issued to him for an Improvement in the Construction of Cars and Carriages intended to run upon Railroads :*

John Elgar, of the city of Baltimore, being duly affirmed, doth declare : That he is by profession and occupation a civil engineer; that he is familiar with the construction of railroads, and the engines and cars for the conveyance of passengers and merchandize used on them; and that, owing to the limited capital applicable to the making of many railroads in this country, they have been necessarily constructed with many curves of short radius, which involved a difficulty in the construction of the cars that did not appertain to straight lines of roads. It was found that if the wheels of a four-wheel car were coupled so far apart as to preserve steadiness of motion, they did not move readily round those short curves, and were in danger of running off the track. To obviate this difficulty the eight-wheel car was devised, which, consisting of a very long body, supported near each end, on the centre of a compact four-wheel car, (called a truck,) completely answered the design, in producing safety and steadiness, as well on curves as on straight lines. The bearings or resting points of each end of the long car body, being in a central position as to the four points of bearing on the rails, the effect of disturbing causes is diminished to one-fourth the amount which occurs in the four-wheel car, where the bearing is necessarily close to the wheels; and from the greater number of wheels, and their peculiar position in the eight-wheel car, the liability to dangerous accidents by the breaking of a wheel or an axle, is greatly lessened, in comparison with the four-wheel car. To the safety and comfort of passengers must be added the convenience

afforded by this kind of cars, in the collection of tickets—they having a passage through the middle, from end to end of the train, which could not be so well accomplished in four-wheel cars.

Now that railway companies and the travelling public have become acquainted with the importance of this new device, and its great advantages established, though late in adopting it, he does not think that companies would be permitted by the public to abandon it. Who in this country would now ride in a four-wheel car? The high speed safely attained on our imperfect roads may be attributed, in great part, to this device. Chief of the advantages enumerated above, apply as well to cars for merchandize as for passengers. Smoothness and steadiness of motion is important in the carriage of many articles, such as flour, crockery, &c.; and these qualities belonging peculiarly to the eight-wheel car, give not only an important relief to the car and to its load of freight or passengers, but to the railway itself. Finally, he fully believes it to be one of the most beneficial improvements that have yet been made in the construction of railway carriages; and, to his own knowledge, it grew to its present perfection, under the direction of the patentee, on the Baltimore and Ohio Railroad. J. ELGAR.

CITY OF BALTIMORE, STATE OF MARYLAND, SS.

On this 7th day of June, 1848, personally appeared before me, the subscriber, a Justice of the Peace, in and for the said City, the within named John Elgar, and made solemn affirmation that the foregoing statements, of his knowledge and belief, relative to the railroad carriage, and known as the "eight-wheel car," are, as he verily believes, just and true.

JAMES BUCHANAN.

## RESPONDENT'S EXHIBIT, No. 11.

### AFFIDAVIT OF CONDUCE GATCH,

*In case of Winans vs. Eaton et al., referred to in Agreement (Pay Rolls.)*

C. P. CURTIS, JR.

WM. WHITING.

Canduce Gatch, a witness produced on behalf of the Complainant, being by me first carefully examined, and cautioned, and duly sworn, according to law, to testify the whole truth, and being examined on behalf of the Complainant, makes oath, deposeth, answereth, and saith, as follows, to wit:

**Q. No. 1.** What was your position and duty in the service of the Baltimore and Ohio Railroad Company, during the year 1830 and 1831? and if you state that you were the master carpenter, state your duties, and as near as you can, state what proportion of the cars built at the expense of the said company, were constructed under your direction, during said years, viz. 1830 and 1831?

A 1. I was called the master carpenter, superintended building cars of various kinds, purchased all the materials, and had the supervision of all the men employed in the building of such cars. All the cars that were built at the company's expense were built under my direction, (except a few passenger cars,) during the years 1830 and 1831.

Q. No. 2. State whether it was or not your duty, under a rule of the said company, to take vouchers for the materials purchased by you, for use in the shops of the said company, under your superintendence, to keep the working time of the men employed in and about them, to pay them for such working time, and also to make regular monthly reports of the work done under your direction, and afterwards to submit the vouchers for materials, the time and pay rolls, and a report of the work done under your direction as vouchers, to the head of the department in which your shops were conducted, to inform the board of directors of said company, for what purposes the monies paid out by you had been expended?

A. 2. It was my duty to make out a correct monthly pay roll, with the time of each hand employed under my direction, and the amount due each workman or laborer, and also a report of work completed in the shop, and also to submit with the report and pay roll generally, vouchers for all the materials purchased by me during the month. They were all submitted to the auditor, Mr. Woodville. The reports of the work done were partial reports; they were not full reports.

Q. No. 3. For what purpose were the reports of work made by you, and for what purpose were the receipts for materials purchased by you submitted to the auditor of said company?

A. 3. I suppose they were for the satisfaction of the officers of the company, and to show that the expenditures were economically and properly made.

Q. No. 4. Will you look at the papers now shown to you, marked "A. B. C. D. and E," and state what they are?

A. 4. They are monthly pay rolls, vouchers for materials purchased, and reports of work done in the month in the shop, for the respective months specified in them.

Q. No. 5. Did you make out different reports for work done by the same hands under your direction, during each month? or was the report of work all included in one?

A. 5. The hands were sometimes employed for other purposes than building cars; such work was generally charged to the department it belonged to, so as to charge it to the construction of the road or wherever it belonged. The monthly reports did not mention work done about the yard, such as repairing cars and such like; it was of work done and finished in the shop. There was no other report made by me. There were vouchers for materials that did not always go in with the report, such as vouchers for large quantities of lumber that I bought and paid for, and I would submit in the middle of the month, or at any other time when I paid them; it would be more correct to say when I closed the transaction.

Q. No. 6. Was the time during which the men employed under your direction, in making and repairing cars in and out of the



shops, kept by you, and was it or not included in the time for which you paid them? state fully.

A. 6. Yes, sir. I paid them for all the work done about the making and repairing of cars, whether done in or out of the shops, and the time was included in the pay-rolls I returned.

C. GATCH.

Sworn to and subscribed, this 1st day of July, 1853, before

LEVIN GALE, *Commissioner*.

(E. GATCH.)

(VOUCHER No. 32.)

(A.)

We, the undersigned, do acknowledge to have received of C. Gatch, master carpenter, the amount hereunto set opposite our names, respectively, in full payment of our services for the time herein specified, while employed under his direction on duties relating to the construction of Wagons, &c., for the Baltimore and Ohio Railroad Company, November 30th, 1830.

No.	NAMES.	Occupation, or nature of expenditure.	No. of voucher.	Term of service.	No. of days.	Rate per day.	Aggregate.	Signers' names.	Witnesses' names, &c.
1	C. Gatch, .....	Master Carpenter, .....	.....	From Nov. 1, to	26	\$2 00	\$52 00	Candace Gatch,	
2	M. Glenn, .....	Carpenter, .....	.....	Nov. 30.	25 $\frac{3}{4}$	1 25	32 18 $\frac{1}{4}$	M. Glenn, .....	M. Glenn,
3	J. Rupp, .....	do .....	.....	do	25	1 25	31 25	J. Rupp, .....	
4	F. A. Gatch, .....	do .....	.....	do	25 $\frac{1}{2}$	1 25	31 87 $\frac{1}{2}$	F. A. Gatch, ..	
5	W. O. Frost, .....	do .....	.....	do	25 $\frac{1}{2}$	1 25	31 87 $\frac{1}{2}$	W. O. Frost, ..	
6	E. Eichelberger, .....	do .....	.....	do	25	1 25	31 25	E. Eichelberger,	
7	J. Eichelberger, .....	Painter, .....	.....	do	23	1 50	34 50	J. Eichelberger,	
8	O. Cromwell, .....	Coachmaker, .....	.....	do	25 $\frac{3}{4}$	1 50	38 62 $\frac{1}{2}$	O. Cromwell, ..	
9	P. Fullerton, .....	Laborer, .....	.....	do	26	75	19 50	P. Fullerton, ..	W. O. Frost
10	L. Forrest, .....	Smith, .....	.....	do	26	1 42	36 92	L. Forrest, ..	F. A. Gatch
11	C. Parraway, .....	Helper, .....	.....	do	26	75	19 50	C. Parraway, }	
12	Dugan & Robb, .....	Sawyers, (each,) .....	.....	Nov. 2 to Nov 4.	1 $\frac{1}{2}$	1 50	* 5 62 $\frac{1}{2}$	Dugan & Robb, }	
13	H. Reynolds, .....	Carpenter, .....	.....	do 16 to do 30.	13	1 25	16 25	Henry Reynolds,	
	Jenkins & Stimpfe, .....	Saddlery, &c., .....	.....	.....	.....	.....	6 94		
	Jno. D. Deaver, .....	Turning, .....	No. 1 & 2	.....	.....	.....	4 93 $\frac{1}{2}$		
	Browning, Gilling'm & Jessop	Hardware, oil & paints,	No. 3	.....	.....	.....	36 98		
			No. 4 & 5	.....	.....	.....			
		* Less error \$5 62 $\frac{1}{2}$ ,	instead	of \$5.25.			\$430 21 $\frac{1}{2}$		
							37 $\frac{1}{2}$		
							\$429 84		

I certify that the above account, amounting to \$429.84 $\frac{1}{2}$ , is correct, and that the articles and expenditures therein charged, were procured and applied in aid of the construction of the Wagons for the Baltimore and Ohio Railroad Company.

November 30th, 1830.

Baltimore, December 1st, 1830, Received of George Brown, Treasurer, the amount of the above account.

I believe the above is correct.

C. GATCH.

C. GATCH.

G. BROWN, Treasurer.

Audited. Four hundred and twenty-nine dollars and eighty-four cents, (\$429.84.)  
(Approved.) P. E. THOMAS, P.

W. WOODVILLE, Auditor.

*A List of work done in November, 1830.*

- To making two new plain box wagons for Hinks, for stone, No. 36 and 37.
- " New sides and brakes to Constellation.
- " Making 1 new coal car on Winans' plan.
- " Making 1 plain box wagon for Hink's, No. 38.
- " Altering 1 old wagon.
- " Altering and fitting up with sash, doors and springs, Col. Long's wagon.
- " Making 2 new wagons for scrap-iron, &c., Winans' plan.
- " Fitting up one old frame for low wheels.
- " Making 2 new plain wagons, Nos. 39 and 40.
- " Fitting up old frame for low wheels.
- " Making 7 pair new shafts, and repairing 20 old do, some both shafts, others with one.
- " Smiths' work for the above shafts and wagons.

Stone.

2  
1  
2  
— 5 =

Winans.

1  
2  
— 3 =

(C. GATCH.)

(VOUCHER No. 58.)

(B.)

We, the undersigned do acknowledge to have received of C. Gatch, master carpenter, the amount hereunto set opposite our names, respectively, in full payment of our services for the time herein specified, while employed under his direction on duties relating to the construction of Wagons, &c., for the Baltimore and Ohio Railroad Company. December, 1830.

No.	NAMES.	Occupation, or nature of expenditure.	No. of voucher.	Term of service.	No. of days.	Rate per day.	Aggregate.	Signers' names.	Witnesses' names, &c.
1	C. Gatch, . . . . .	Master Carpenter, . . . . .	.....	From Dec. 1, to	26	\$2 00	\$52 00	C. Gatch, . . . . .	
2	M. Glenn, . . . . .	do	.....	Dec. 31.	13	1 25	16 25	M. Glenn, . . . . .	
3	J. Rupp, . . . . .	do	.....	do	26	1 25	32 50	J. Rupp, . . . . .	F. A. Gatch.
4	F. A. Gatch, . . . . .	do	.....	do	16	1 25	20 00	F. A. Gatch, . . . . .	
5	W. O. Frost, . . . . .	do	.....	do	26	1 25	32 50	W. O. Frost, . . . . .	
6	E. Eichelberger, . . . . .	do	.....	do	26	1 25	32 50	E. Eichelberger, . . . . .	
7	J. Eichelberger, . . . . .	Painter, . . . . .	.....	do	16	1 50	24 00	J. Eichelberger, . . . . .	
8	O. Cromwell, . . . . .	Coachmaker, . . . . .	.....	do	26	1 50	39 00	O. Cromwell, . . . . .	
9	H. Reynolds, . . . . .	Carpenter, . . . . .	.....	do	26	1 25	32 50	Henry Reynolds, . . . . .	
10	L. Forrest, . . . . .	Smith, . . . . .	.....	do	26	1 42	26 92	L. Forrest, . . . . .	O. Cromwell
11	C. Paraway, . . . . .	Helper, . . . . .	.....	do	26	75	19 50	C. Paraway, . . . . .	
12	P. Fullerton, . . . . .	Laborer, . . . . .	.....	do	26	75	19 50	P. Fullerton, . . . . .	
13	D. McAvoy, . . . . .	Drayman, . . . . .	1	.....	.....	.....	6 91½		
14	R. Greenough, . . . . .	Stone, window sash & glass	2	.....	.....	.....	4 00		
15	Deaver, Tibbes & Jenkins, . . . . .	Turn 'g, leath' r, nuts, &c.	3	.....	.....	.....	7 75		
16	Wm. S. Browning, . . . . .	Hard're glass, oil, paints	4	.....	.....	.....	19 16		
17	Gillingham & Jessop, . . . . .	Hardware, . . . . .	5	.....	.....	.....	21 91		
							\$416 90½		

I certify that the above account, amounting to \$416.90½ is correct, and that the articles and items therein charged, were procured and applied in aid of the construction of the Wagon for the Baltimore and Ohio Railroad Company, December 31, 1830.

C. GATCH, M. C.

Amount, . . . . . \$416 90½  
Error in No. 1, . . . . . 10

\$416 80½

Baltimore, 1st January, 1831, Received of Geo. Brown, Treasurer, the amount of the above account.

C. GATCH.



I believe the above is correct.

Audited. Four hundred and sixteen dollars and eighty and a half cents, (\$416.80½.)

(Approved.)

P. E. THOMAS, P.

G. BROWN, Treasurer.  
W. WOODVILLE, Auditor.  
JOHN N. BROWN.

*Work done in December, 1830.*

- Two plain box wagons, Nos. 41 and 42.
- Two trussels for the transportation of horses and carriage.
- One baggage wagon.
- One plain box wagon, No. 43.
- To fitting up Col. Long's wagon with springs, glass, &c.
- To making 160 lights sash for shop.
- To making 4 plain box wagons, Nos. 44, 45, 46 and 47.
- To making new sides for coach, with brakes, complete.
- 1 new pair of shafts; 13 pair repaired.
- Smith work for the above; painting.

We, the undersigned, do acknowledge to have received of C. Gatch, master carpenter, the amount hereunto set opposite our names, respectively, in full payment of our services for the time herein specified, while employed under his direction on duties relating to the construction of Wagons, &c., for the Baltimore and Ohio Railroad Company, January, 1831.

No.	NAMES.	Occupation or nature of expenditure.	No. of vouchers.	Commence't & expiration of service.	No. of days.	Rate per day.	Aggregate.	Signers' names.	Witnesses' names, &c.
1	C. Gatch, .....	Master Carpenter, .....	.....	Jan. 1 to 31, inclu.	26	\$2 00	\$52 00	C. Gatch, M. C.	
2	M. Glenn, .....	Carpenter, .....	.....	.....	26½	1 25	31 87½	M. Glenn, .....	
3	J. Rupp, .....	do .....	.....	.....	26	1 25	32 50	J. Rupp, .....	M. Glenn.
4	F. A. Gatch, .....	do .....	.....	.....	21½	1 25	26 56½	F. A. Gatch, ..	
5	W. O. Frost, .....	do .....	.....	.....	25½	1 25	31 87½	W. O. Frost, ..	
6	E. Eichelberger, .....	do .....	.....	.....	26	1 25	32 50	E. Eichelberger	
7	J. Eichelberger, .....	Painter, .....	.....	.....	10½	1 50	15 75	J. Eichelberger,	
8	O. Cromwell, .....	Coachmaker, .....	.....	.....	12½	1 50	18 75	O. Cromwell, ..	
9	H. Reynolds, .....	Carpenter, .....	.....	.....	25½	1 25	31 87	Henry Reynolds	
10	R. Aler, .....	do .....	.....	.....	24	1 25	30 00	Reuben Aler, ..	
11	L. Forrest, .....	Smith, .....	.....	.....	26	1 42	36 92	L. Forrest, ..	R. Aler.
12	P. Fullerton, .....	Laborer, .....	.....	.....	26	75	19 50	P. Fullerton, ..	
13	Robb & Co., .....	Sawyers, 15 days each, .....	.....	.....	30	1 50	45 00	A. Robb & Co.,	
14	C. Paraway, .....	Helper to smith, .....	.....	.....	26	75	19 50	C. Paraway, ..	R. Aler.
	McAvoy, .....	Drayman, .....	See re-ceipt in pass book.	.....	.....	.....	14 68½	Wm. S. Brown's	
	Wm. S. Browning, .....	Oils, paints & hardware	1	.....	.....	.....	20 07	Wm. S. Browning	
	Wm. Gillingham & Ensey, ..	Hooks, rivets & brooms	2 & 3	.....	.....	.....	4 05		
	Gillingham & Jessop, .....	Hardware, .....	4	.....	.....	.....	15 98½		
							\$479 40		

I certify that the above account, amounting to \$479.40, is correct, and that the above mentioned items therein charged, were procured and applied in aid of the construction and repairing of cars, &c., for the Baltimore and Ohio Railroad Co., January, 1831.

CANDUCE GATCH.

CANDUCE GATCH.

I believe the above to be correct.

G. BROWN, Treasurer.

P. E. THOMAS.

Approved,

Audited. Four hundred and seventy-nine dollars and forty cents. (\$479.40.)

W. WOODVILLE, Auditor.

JOHN N. BROWN.

*A list of work done at the depot on Pratt Street, throughout January, 1831.*

- To new sides on coach Baltimore.
- “ “ Constitution.
- “ two new Winans' cars for coal, &c.
- “ new sides on Maryland.
- “ two new Winans' cars for coal, &c.
- “ new sides on house car.
- “ one new snow-car and repairing.
- “ three new common cars for stone and iron.
- “ one new Winan wagon.
- “ smith work.
- “ two plain box wagons.
- “ painting, &c.

CANDUCE GATCH, M. C.

(C. GATCH.)

VOUCHER No. 31.

(D.)

We, the undersigned, do acknowledge to have received, of C. Gatch, master carpenter, the amount hereunto set opposite our names, respectively, in full payment of our services for the time herein specified, while employed under his directions, on duties relating to the construction of wagons, &c., for the Baltimore and Ohio Railroad Company, February 28th, 1831.

No.	NAMES.	Occupation or nature of expenditure.	No. of voucher.	Commencement and expiration of service.	No. of days.	Rate per day.	Aggregate.	Signers' names.	Witnesses' names, &c.
1	C. Gatch, .....	Master carpenter, .....	.....	Feb. 1st, to 28th,	24	\$2 00	\$48 00	C. Gatch, M.C.	
2	M. Glenn, .....	Carpenter, .....	.....	do do	24	1 25	30 00	M. Glenn, .....	
3	J. Rupp, .....	do .....	.....	do do	24	1 25	30 00	J. Rupp, .....	M. Glenn.
4	F. A. Gatch, .....	do .....	.....	do do	20½	1 25	25 62½	F. A. Gatch, .....	
5	W. O. Frost, .....	do .....	.....	do do	24	1 25	30 00	W. O. Frost, .....	
6	E. Eichelberger, .....	do .....	.....	do do	24	1 25	30 00	E. Eichelberger	
7	J. Eichelberger, .....	Painter, .....	.....	do do	14	1 50	21 00	J. Eichelberger,	
8	O. Cromwell, .....	Coachmaker, .....	.....	do do	23	1 50	34 50	O. Cromwell, ..	
9	H. Reynolds, .....	Carpenter, .....	.....	do do	24	1 25	30 00	H. Reynolds, ..	
10	R. Aler, .....	do .....	.....	do do	24	1 25	30 00	Reuben Aler, ..	
11	L. Forrest, .....	Smith, .....	.....	do do	24	1 42	34 08	L. Forrest, ..	R. Aler.
12	P. Fullerton, .....	Laborer, .....	.....	do do	24	0 75	18 00	P. Fullerton, ..	
13	Robb & Co., .....	Sawyers, two each, .....	.....	do do	24	1 50	48 00	A. Robb & Co.,	
14	C. Parraway, .....	Helper to smith, .....	.....	do do	16	0 75	17 81½	C. Parraway,	R. Aler.
	M. Drake and J. Ready, .....	Wood-cutters & insp'tn	1 & 2	.....	23½	.....	1 52		
	Daniel McEvoy, .....	Hauling, .....	3	.....	.....	.....	15 31½	Wm. S. Brown 'g	
	Wm. S. Browning, .....	Glass, oil, paints, &c.	4	.....	.....	.....	11 30½		
	Gillingham and Jessop, .....	Hardware, &c., .....	5	.....	.....	.....	17 61		
							\$472 76½		

I certify that the above account, amounting to \$472.76½, is correct, and that the above articles, items therein charged, were procured and applied in aid of construction and repairs of wagons, &c., for the Baltimore and Ohio Railroad Company, February 28, 1831.

G. BROWN, Treasurer.

P. E. THOMAS, P.

Approved,  
Baltimore, March 1st, 1831.

Audited. Four hundred and seventy-two dollars seventy-six and a half cents. (472.76½.)

Received, the amount of the above account.

W. WOODVILLE, Auditor.

CANDUCE GATCH.

J. N. BROWN



*Amount of work done February, 1831, at the B. & O. R. R. Company's shops.*

5th. One new Winan wagon for coal.

11th. New sides on Ohio coach.

12th. Four new Winan wagon for coal and flour.

15th. One new Winan wagon for do.

28th. New sides on Chesapeake coach.

Coachmaking, smithing, &c.

CANDUCE GATCH, M.C.

(C. GATCH.)

(VOUCHER No. 39.)

(E.)

We, the undersigned, do acknowledge to have received of C. Gatch, master carpenter, the amounts hereunto set opposite our names, respectively, in full payment of our services for the time herein specified, while employed under his direction on duties relating to the construction of wagons, &c., for the Baltimore and Ohio Railroad Company.

No.	NAMES.	Occupation or nature of expenditure.	No. of vouchers.	Terms of service.	No. of days.	Rate per day.	Aggregate.	Signers' names.	Witnesses' names, &c.
1	C. Gatch, .....	Master Carpenter, .....	.....	From 1st March to	27	\$2 00	\$54 00	C. Gatch, M.C.	
2	J. Rupp, .....	Carpenter, .....	.....	31st March.	26	1 25	32 50	J. Rupp, .....	M. Glenn.
3	F. A. Gatch, .....	do .....	.....	do	18½	1 25*	23 25	F. A. Gatch, ..	23 12
4	W. O. Frost, .....	do .....	.....	do	25½	1 25	31 75½	W. O. Frost, ..	31 87½
5	E. Eichelberger, .....	do .....	.....	do	27	1 25	33 75	E. Eichelberger,	
6	J. Eichelberger, .....	Painter, .....	.....	do	26½	1 50	39 37½	J. Eichelberger,	
7	O. Cromwell, .....	Coachmaker, .....	.....	do	27	1 50	40 50	O. Cromwell, ..	
8	H. Reynolds, .....	Carpenter, .....	.....	do	27	1 25	33 75	Henry Reynolds	
9	R. Aler, .....	do .....	.....	do	26½	1 25	33 25½	R. Aler, .....	
10	L. Forrest, .....	Smith, .....	.....	do	26	1 42	36 92	Leo'd & Forest,	H. Reynolds
11	P. Fullerton, .....	Laborer, .....	.....	do	27	0 75	20 25	P. Fullerton, ..	
12	Robb & Co., .....	Two Sawyers, each, ..	.....	do	26½	1 50	79 50	Robb & Co., ...	
13	C. Parraway, .....	Helper to smith, .....	.....	do	27	0 75	20 25	C. Parraway,	M. Glenn.
14	M. Glenn, .....	Carpenter, .....	.....	do	26½	1 25	33 12½	M. Glenn, .....	
	Gillingham & Jessop, .....	Hardware, .....	1	do			31 56		
	Conrad Keller, .....	Turner, .....	2	do			1 75		
	Wm. S. Browning, .....	Oils, paints, lead, &c.,	3	do			62 87½		
	McAvey, .....	Drayman, .....	4	do			20 25		
		{ In a pass-book countersigned by }							
		{ the auditor, and returned. }							
		By amount received for repairs for Cooper's Engine, .....					\$628 60½		
		Total balance, .....					29 19		
		Deduct error in the item of, .....					\$599 41½		
							12½		
							\$599 29		

I certify that the above account, amounting to \$599.29½, is correct, and the services and articles therein charged were procured and applied in aid of the construction of wagons, &c., for the Baltimore and Ohio Railroad Company, March 31st, 1831.

Baltimore, April 1st, 1831. Received of George Brown, the amount of the above account.

I believe the above to be correct.

Audited. Five hundred and forty-nine dollars and sixteen and a half cents.

Approved.

C. GATCH.

G. BROWN, *Treasurer*.

W. WOODVILLE, *Auditor*.

P. E. THOMAS, P.

JN. BROWN.

Amount brought down,.....	\$599 29
Error—deduct,.....	12½
Work applied to carriages destined for New Orleans,.....	50 12
	<hr/>
	\$549 16½

*Amount of work done throughout March, 1831.*

Two Winan wagons, for flour, Nos. 23 and 24.

Four common box wagons.

Two Winans wagons, for flour, Nos. 25 and 26.

One common box wagon.

Two common box wagons.

One Winans wagon, No. 27.

Running gear for two Winans cars for Orleans, Nos. 28 and 29.

do two do wagons for stone.

do three do do.

do one do do.

26th.

“

“

And I, Levin Gale, Commissioner as aforesaid, do hereby certify that the foregoing deposition of Canduce Gatch was taken pursuant to the practice prevailing in the District of Maryland, and that the annexed notice was served on William W. Hubbell, Esquire, attorney for the Defendants, on the twenty-first day of June, at my office, in the city of Baltimore, and that the day fixed therein, was fixed at his suggestion and for his accommodation; and I do certify that the reason for taking the deposition of the said Canduce Gatch is, that the said Canduce Gatch resides within the District of Maryland, and more than one hundred miles from the place of trial of said cause; that the said Canduce Gatch was by me first carefully examined and cautioned and duly sworn, according to law, to testify the whole truth, and that the foregoing deposition was then reduced to writing by me and thereafter subscribed by the said Canduce Gatch in my presence; and I do further certify that I am not of counsel or attorney for either of the parties to the said cause, and that I am not interested in the event of the said cause.

[L. S.] Given under my hand and seal, this first day of July, in the year eighteen hundred and fifty-three.

LEVIN GALE.

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## RESPONDENT'S EXHIBIT, No. 12.

### DRAWING MARKED G.

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

I, Joseph F. Sabine, a Commissioner appointed by the Circuit Court of the United States for the District of Massachusetts, to take testimony in the above named cause, do hereby certify that the drawing marked G, to which this is annexed, is the same referred to by Christian E. Detmold, John B. Jervis, Henry Waterman, William J. McAlpine, Albert Bridges, John Wilkinson, Walter McQueen, Jeremiah Van Rensselaer, Charles B. Stuart, Charles Minot, Edmund French, William C. Young, George Beach, and Stephen W. Worden, in their depositions in this cause, taken before me; and that I have signed my name thereto as a further identification thereof.

I shall sign and seal this certificate, and direct the same with the drawing to the aforesaid Court.

Witness my hand and seal, this 16th day of December, A. D., 1853.

JOSEPH F. SABINE, *Commissioner*.



**RESPONDENT'S EXHIBIT, No. 13.****DRAWING MARKED H.**

ROSS WINANS vs. THE EASTERN RAILROAD COMPANY.

I, Joseph F. Sabine, a commissioner appointed by the Circuit Court of the United States for the District of Massachusetts, to take testimony in the above-named cause, do hereby certify that the drawing marked H, to which this is annexed, is the same referred to by Christian E. Detmold, John B. Jervis, Henry Waterman, William J. McAlpine, Albert Bridges, John Wilkinson, Walter McQueen, Jeremiah Van Rensselaer, Charles B. Stuart, Charles Minot, Edmund French, William C. Young, George Beach, and Stephen W. Worden, in their depositions taken before me in this cause; and that I have signed my name thereto as a further identification thereof.

I shall sign and seal this certificate, and direct the same with the drawing to the aforesaid Court.

Witness my hand and seal, this 16th day of December, A. D. 1853.  
JOSEPH F. SABINE, *Commissioner*.

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**RESPONDENT'S EXHIBIT, No. 14.****FAIRLAMB'S LETTERS PATENT, &c.**

ROSS WINAN vs. THE EASTERN RAILROAD COMPANY.

I, Joseph F. Sabine, a Commissioner appointed by the Circuit Court of the United States for the District of Massachusetts, to take testimony in the above named case, do hereby certify that the exemplified copy of Letters Patent and Specification and Drawing to which this is annexed, is the same referred to by John B. Jervis, Henry Waterman, William J. McAlpine, Albert Bridges, John Wilkinson, Walter McQueen, Jeremiah Van Rensselaer, Charles B. Stuart, Charles Minot, Edmund French, William C. Young, George Beach and Stephen W. Worden, in their depositions in this cause, taken before me; and that I have signed my name thereof, as a further identification thereof.

I shall sign and seal this certificate, and direct the same, with the exemplified copy of Letters Patent, Specification and Drawing, to the aforesaid Court.

Witness my hand and seal, this 16th day of December, A. D. 1853.  
JOS. F. SABINE, *Com'r*.

**RESPONDENT'S EXHIBIT, No. 15.**

CIRCUIT COURT U. S. MASS, DISTRICT, — ROSS WINANS vs. THE EASTERN R. R. COMP'Y

This is the paper Exhibit referred to as the "Specification and Drawings of Fairlamb's Patent," by John Murphy, George M. Smith, Wm. Petit, Septimus Norris, John C. A. Smith, Richard French and Jacob S. Shryack, in their depositions, taken under a Commission issued out of the Circuit Court U. S. in and for the Massachusetts District, to us directed, for the examination of witnesses therein named, in a certain cause pending in said Court, wherein Ross Winans is Plaintiff, and the Eastern Railroad Company is Defendant, before us,

CHAS. F. HEAZLITT, }  
ROBERT P. KANE, } *Commissioners.*

**RESPONDENT'S EXHIBIT, No. 15.****FAIRLAMB'S LETTERS PATENT, &c.**

THE UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting :

This is to certify, that the annexed is a true copy from the records of this Office, of Letters Patent issued to Jonas P. Fairlamb, on the nineteenth day of January, eighteen hundred and thirty-three.

[L. S.] In testimony whereof, I, R. C. Weightman, Acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this nineteenth day of April, in the year of our Lord one thousand eight hundred and fifty-three, and of the Independence of the United States the seventy-seventh.

R. C. WEIGHTMAN.

THE UNITED STATES OF AMERICA.

To all to whom these Letters Patent shall come :

Whereas JONAS P. FAIRLAMB, a citizen of the United States, hath alleged that he has invented a new and useful improvement in constructing railroad cars, which improvement he states has not been known or used before his application ; hath made oath that he does verily believe that he is the true inventor or discoverer of the said improvement ; hath paid into the treasury of the United States the sum of thirty dollars, delivered a receipt for the same, and presented a petition to the Secretary of State, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose : These are therefore to grant, according to law, to the said Jonas P. Fairlamb, his heirs, administrators or assigns, for the term of fourteen years, from the nineteenth day of January, one thousand eight hundred and thirty-three, the full and exclusive right and liberty of making, constructing, using and vending to others to be used, the said improvement, a description whereof is given in the words of the said Fairlamb himself, in the schedule hereto annexed, and is made a part of these presents.

In testimony whereof, I have caused these Letters to be made Patent, and the seal of the United States to be hereunto affixed.

[L. S.] Given under my hand, at the City of Washington, this nineteenth day of January, in the year of our Lord one thousand eight hundred and thirty-three, and of the Independence of the United States of America the fifty-seventh.

ANDREW JACKSON.

By the President,

EDW. LIVINGSTON,  
*Secretary of State.*

CITY OF WASHINGTON, TO WIT :

I do hereby certify that the foregoing Letters Patent were delivered to me on the nineteenth day of January, in the year of our Lord one thousand eight hundred and thirty-three, to be examined ; that I have examined the same, and find them conformable to law ; and I do hereby return the same to the Secretary of State, within fifteen days from the date aforesaid, to wit : on this nineteenth day of January, in the year aforesaid.

R. B. TANEY,

*Attorney General of the United States.*

### THE SCHEDULE

*Referred to in these Letters Patent, and making part of the same, containing a description, in the words of the said Jonas P. Fairlamb himself, of his improvement in constructing rail cars.*

To all to whom these presents shall come :

Be it known that I, Jonas P. Fairlamb, of the City of Philadelphia, in the State of Pennsylvania, have invented a new and useful improvement in cars for running on rail or other roads ; and that the following is a full and exact description of the construction and operation of the said car or machine, as invented or improved by me. The frame, or what is generally called the wooden part of this car, is similar to those in common use, with the exception of a piece of timber, or other substance of sufficient strength, extending lengthwise of the car, at equal distance from each side, and of convenient height from the axle to insert or attach the necessary vertical rollers hereafter mentioned. I provide the following described boxes, plates and bearings for the journals of the axles to move in, to wit : plates of iron or other strong substance, of sufficient width, length and thickness, with circular flanges on the one side or outer edge thereof, extending downwards a sufficient distance to contain the necessary horizontal conical rollers and movable boxes or bearings in which the journals of the axles run, the radii of the in and concave side of these circular flanges being half the length of the axle or shaft on which the wheels are fastened. These plates I attach or fasten to the frame of the car, in their proper places, to suit their corresponding journals of the two axles, by iron bolts or other fastenings of sufficient strength. I provide for each bearing two, three or more conical rollers, of sufficient diameter, length and strength, which I confine in a strong frame, each set forming part of a cone, the vertex of which is the middle distance between the ends of the axles, and their plain is near horizontal as their cones will admit. I also provide vertical rollers, two or more, for each set of conical rollers, confined in the convex outer part of the same frame, and of the same diameter as the largest diameter of the said conical rollers, the journals of all the rollers being so much less in diameter than their respective rollers as to



admit their frame to vibrate freely with the rollers without friction by coming in contact either with the underside of the aforesaid horizontal plate, or inside of the said vertical circular flange thereof, against which plate and flange the periphery of these rollers bear, their planes forming a horizontal circular groove or rabbet for each box, in which groove I place a moveable box resting against the periphery of the rollers, in which box the journal of the axle runs, at or near the ends of the aforesaid plates. I form vertical flanges to prevent the said box from vibrating further than necessary, and to enable me to enclose the whole box, rollers and journals, and thereby keep out the dust, and to contain therein a sufficient quantity of oil, which I supply through an aperture in the upper plate. I provide two horizontal circular plates or rings of less diameter than the distance between the wheels on their corresponding axles; the centres of these two circles or rings are the middle distance from the ends of the axles or shafts. These circles I confine to their proper place by boxes connecting them with their respective axles, and the axles passing through and revolving in those boxes.

To the first mentioned piece of timber or other material of sufficient strength I attach two vertical friction rollers, for each of said circles to rest against, and roll, when acted on by the cone of the wheels and vibrating of the axles. The middle distance between each end of the axle is common to the vertex of the conical rollers and the cones formed by them at each end of the axle, and to the centres of the two horizontal circles in which the vertical rollers are placed. The operation of this car is as follows: the wheels being conical, with their vertexes opposite, will always adjust the axles at right angles with the railway, crooked or straight, while or at the time the car passes over the same. They have no tendency to leave the track on a curve, and prevent the flanges of the wheels from pressing against the inside of the rails; and the whole, with the above arrangement and construction of boxes and horizontal circles, conical and vertical rollers, operates freely, with an immense saving of reaction on curves.

To alter cars or locomotive engines already made, without affecting the engine, I let the crank axle remain permanent, as at present used, and loose one wheel.

I therefore claim the exclusive right to the invention of the construction of the above boxes, rollers, and circular plates or rings, as applied by me to cars travelling rail or other roads, and all other parts of the above-mentioned and described car, not heretofore used or known.

In witness whereof I have hereunto set my hand, this 29th day of December, Anno Domini, one thousand eight hundred and thirty-two.

J. P. FAIRLAMB.

Witnesses—T. SHEPPARD,

JOHN ALDERSON.

## REFERENCES

*To the Drawings of Jonas P. Fairlamb's Improvements in constructing Railroad Cars. See Drawing.*

## FIG. 1.

*A. A.* Bottom Frame of the Car Bed. *B. B. B. B.* Boxes, Plates and Bearings, (see Fig. 3) *c. c.* Circular Rings. *D. D. D. D.* Boxes. *E. E. E. E.* Friction Rollers. *F. F. F. F.* Car Wheels.

## FIG. 2.

*A. A.* The Circular Rings, or Plates, as may be attached to two common cars, or improved cars, connected by a long bodied car bed, *B. B.*

## FIG. 3.

*a. a.* Plate or Outside Box, in which the above Boxes, Frames and Conical Rollers vibrate.

*b. b.* Strong Frame in which the Journal of the Rollers revolve.

*c. c. c. c. c. c.* Horizontal Conical Rollers.

*d. d. d. d. d. d. d.* Vertical Rollers.

*e. e. e. e.* Apertures for bolts to fasten the said Outside Box or Plate to the car.

*f.* Box in which the Journal of the Axle revolves.

*g.* Half an axle.

## CITY OF PHILADELPHIA, STATE OF PENNSYLVANIA, ss.

On this second day of September, A. D. 1837, before me, the subscriber, one of the Aldermen of the said city, personally appeared Jonas P. Fairlamb, Civil Engineer, of the city of Philadelphia aforesaid, and made solemn oath that he is interested as inventor, in a patent for an "improvement in constructing railroad cars," issued to him, the said Jonas P. Fairlamb, and dated the nineteenth day of January, A. D. one thousand eight hundred and thirty-three, and that the above and foregoing drawings and *References* thereto are, as he verily believes, a true delineation of the invention, as described in the said Letters Patent.

Witness my hand and seal, the day and year aforesaid.

JOHN THOMPSON, *Aldm'n.*

## RESPONDENT'S EXHIBIT, No. 16.

## WILLIAM &amp; E. W. CHAPMAN'S PATENT.

## THE REPERTORY OF ARTS, MANUFACTURES, AND AGRICULTURE.

No. CXLI.

SECOND SERIES.

FEB. 1814.

*Specification of the Patent granted to WILLIAM CHAPMAN, of Murton-House, in the County of Durham, now of Newcastle upon Tyne, Civil Engineer; and EDWARD WALTON CHAPMAN, of Willington-Ropery, in the Parish of Walls-end, in the County of Northumberland, Rope-maker, for a Method, or Methods, of facilitating the Means, and reducing the Expense of Carriage on Railways and other Roads.*

(Dated December 30, 1812. With a Plate.)

To all to whom these presents shall come, &c.

Now KNOW YE, that we the said William Chapman and Edward Walton Chapman, do hereby describe the nature of our said invention, and that the same is to be performed and carried into effect in manner following; that is to say: Our said invention doth chiefly consist in the use of a chain or other flexible and continuous substance stretched along the road to be travelled, properly secured at each end, and at suitable intervals; and in the application of this chain round, or partially round, a barrel or grooved wheel, in such a manner as not to slip when this grooved wheel, which is fixed upon, before, or [130\*] behind, a carriage, supporting or containing any internal self-moving power, shall be put in motion by the said power, so that by the revolution of the barrel or grooved wheel round its axis, either one way or the other, it shall necessarily draw the said carriage, and any others which may be attached to it, within its powers of action.

We also, as the carriage containing the motive power will, thus loaded, be too heavy in various cases for the strength of the existing iron or wooden rails, if resting on four wheels only, so arrange it for such ways (or other confined ways, where the ledges either of the ways or of the wheels regulate the direction of the carriage) that it may rest equably, and move freely round curves or angles, either on six or eight wheels, so as to reduce its pressure on each in the inverse proportion of its number of wheels. Having thus described the outlines of the separate leading parts of our invention, we shall proceed to the means of carrying them into effect.

[\* The numbers and asterisks in brackets, indicate the paging in the original.]

Fig. 1, (Plate V.) in the annexed plan, is an elevation of a carriage containing the motive power, be it steam, inflammable gas, or what it may. 1 is a grooved wheel, round which the chain partially laps. This groove should be angular, and contain a number of Ys of iron or other substance of the form of the Roman letter V, with intervals between them, so that the chain, when pressed into the groove, shall not be liable to slip. 2, 2, are two guide sheaves, or pulleys, under which the chain leads in each direction of the road, and above which it takes its course round as large a portion of the periphery of the wheel 1, as it conveniently can. It is evident, that on the advancing side of this wheel, the chain will be drawn tight into the groove; and that, unless the chain be kept heavily stretched, it will be slack on the retiring side, and consequently slip; to prevent which we press the [131\*] chain into the groove by either the wheel 3 or 4, accordingly as either of them shall be on the rear or retiring side. These compressing wheels may either have a rim suitable to go into the groove of the wheel 1, upon the chain, or these wheels may have suitable cogs, of sufficient breadth, to correspond with similar cross openings in the rims of the grooved wheel, sufficiently deep for the cogs of the former to press upon the chain. On inspection of Fig. 1, it will be seen that the alternate action of these wheels can be quickly effected by changing the position of the weight 5, to either before or behind its axis (whether it be that of the wheel 1, or another), as it is fixed on a lever with two short arms, so as on the change of position, to draw one of the pressing wheels into the groove (or one of its cogs across it), and retire the other from it; both these wheels being so supported, or placed, as to admit of the requisite change of position.

6 is a small pulley or sheave at the opposite end of the carriage, with or without side rollers, to guide the carriage when moving with that end foremost. The diameter of the pulley 6, should be as small as it conveniently may be, so as to enable it to pass over 7, 7, which are Ys or forks placed at certain intervals, into which the chain falls, and is held so as to resist the action of the carriages; but at the same time will rise out of any one of them, when the carriage approaches so near as to cause the line of chain between it and the fork to form a considerable angle below the horizon. 7 *a*, is a transverse elevation of the fork (upon a larger scale) shewing the vertical slit in which, after being guided there by the oblique arms of the fork, the chain rests by the gravity of the part suspended, or supported on that point. 7 *b*, shews in plan, the position of the chain, with one of its links vertically in the slit. These forks will only be necessary at [132\*] certain intervals, where 3 or 4 of them may be placed 5 or 10 yards asunder, so as to admit of sufficient length of chain to press it into the groove by its weight, and



give a moral certainty of some one of them holding. They will be particularly useful when several locomotive engines, with their trains of carriages, follow each other in succession; and also, in situations where the road varies its degree of ascent, because where it does so materially, stronger chains may then be used in the steeper parts, as the increased action cannot extend beyond the forks. The ends of the chain may be tightened by small horizontal barrels or windlasses, which, if on the railway, should be low enough for the axles of the carriages to pass over; and wherever high roads are passed, or carriages have to cross the line of chain, it should fall into a proper groove or channel to prevent its being injured.

If in place of passing the chain partially round a grooved wheel, in the manner described, it should be deemed eligible to give it one or more turns round a barrel, it will be necessary to prevent the progressive revolutions of the chain from passing to one end of it. One of the means of effecting this will be to place longitudinally upon the barrel six or eight chocks or wedges, of hard wood or metal, declining towards one end as in a capstan, so that the chain may slide in the line of the axis, and keep a proper position without overlapping itself. It is obvious that carriages using the same chain cannot pass each other in any direction; therefore there must either be two railways, one for each direction; or the alternate conveyance must take place at the termination of given stages or lengths of way, which, to keep up a regular and uninterrupted succession, should be performed in equal portions of time. We shall now give an example of each, suited to railways of wood or iron.

[133\*] Two parallel ways, with their respective chains, are easily conceived. The only difficulties lie in the terminations from whence all the successive carriages return, and in places where, to avoid additional expense in deep cuts through high ground, in embankments, or in frame work over vallies, one road is made to serve both ways.

Fig. I. I. shews the termination of a double way, in which every locomotive engine, with its train of waggons, may travel the whole distance. The strong parallel lines shew the way upon which the carriages have travelled to this termination; and the strongly *dotted* or *broken* parallel lines shew that on which the *return carriages* are to go; *these carriages* are expressed by the Roman capitals N, N, in similar lines, and are there ready to be taken off by the locomotive engine shewn by the Roman letter M, attached by the line *u, v*, to the train of carriages shewn by the capitals N, N, in strong lines, which it has just brought to their termination, so as to admit their going individually and uninterruptedly to their adjacent place of loading or delivery, whichever it may be. In this and the subsequent figures, shewing parts of

railways, ‘:’ denote the forks already described; ‘o,’ shews the position of an upright short post, to guide the chain upon the way where there is any curve or angle, and which post must necessarily be on the concave side of the bend of the chain; ‘||’ shews the termination of the chain, either with or without a windlass.

The position of the chain is shown by a small waved line thus, ~~~~~ Fig. II. also shows that the locomotive engine has travelled to its termination on a continuous line of railway, whilst the waggons attached to it have, to admit their being taken away without impediment, been drawn on to the road parallel to it. To effect this, the engine, before it arrives at the point *a*, [134\*] where the road diverges, must have its track line or other fastening slacked off to a suitable length, and after it has passed the point *a*, a person attending should put in the switch rail (or bar turning on a pin at one end) to this point of the diverging road, so as to cause the wheels of the train of carriages to turn off in that direction. When this is done, the locomotive engine will be ready to take the contrary course with such waggons as may be ready assembled, or be afterwards collected for it. It is however obvious, that as it has to travel on another line of way, and draw itself by another chain, that some preparatory alteration must now take place. It may be easily done by the following process:—It is clear that without inconvenience to any succeeding train of carriages, the chain may be separated or detached any way between *b* and *c*, because the fork at and beyond *b*, will prevent the chain from being hauled away by any action upon it in that direction. Any where between *b* and *a*, or on that side of *b*, the chain should be capable of being easily separated, either when slacked off at the extremity, or drawn together by a light luff tackle, with its opposite blocks a sufficient distance asunder, when the chain may be separated or unhooked, which will in general be best done when the parts overlap each other a yard or two. The hook at each extremity may then be inserted into such link as is suitable, by which means less accuracy is requisite, and the re-joinction of the end of the chain leading from the adjacent termination at *t*, with the end of that belonging to the other way, may be effected in a similar manner. The switch rail *s*, *a*, being then put into its place, the engine and its train of waggons may proceed on the return way, and the former line of chain be re-joined; but on this re-joinction, it will be found that the part leading from the extremity at *t*, will be apparently [135\*] elongated, and virtually so as to the lengths extended before and subsequently to the passage of the engine along the return way, which is an inconvenience attendant on the engine coming by one chain and returning by another; because during the whole progress of its motion, it transposes the local position of every portion of the chain it passes over, and ad-

vances it to an extent equal to what is requisite to lap over the grooved wheel when lifted up between the two guide pullies. This effect must necessarily vary the points of re-junction of the chain between *b* and *a*, and also require at due intervals of time, portions of that end of the chain which the engine advances towards, to be taken off and added to the retiring end, for which purpose it will be eligible that the chain may be composed of certain lengths (10 or 15 yards more or less) connected together by shackles, or other means, so as each portion may easily be detached from one chain and added to the other, in the progressive course of their revolution. This inconvenience will not take place when the engine returns by the same chain on which it advanced, *viz*: when one engine only travels upon a stage, as will shortly be described.

In the first instance, where locomotive engines, in incidental succession, pursue each other on one road and return by another, Fig. III. shews where the loaden and light ways casually unite in one. In this case, as both the chains must run along the single way, there would be some danger of their entangling by one lifting the other; therefore it will be advisable in these parts, where the ways are thrown into one, to have two additional rails, one a little within, and the other without their correspondent rails, so as to keep the chains asunder, as shewn by the strong dotted lines at *x*, Fig. III. When a railway [136\*] is laid out in successive stages, so that only one engine travels on each, and returns with the carriages brought to it from the adjacent stage, then a single way only is requisite, excepting at their point of interchange, which may be so managed as to be done simply by an easy transfer of the carriages, without any detaching of the ground chains, for which see Fig. IV., where the railways of the two stages are made simply to overlap each other for a due extent, to hold the carriages. They must have from each end, as shewn by the strongly dotted or broken lines, a converging or slanting communication with each other, along which each engine, by its lengthened track line, drags its train of waggons (as in the explanation of Fig. II.) ready to be taken onwards by the opposite engine.

It will obviously occur, that one stage will be sufficient in short distances, or even in longer ones, with a correspondent reduction of the quantity to be daily conveyed. And likewise that more than one locomotive engine may be employed on the same stage of a single way, provided they follow each other in close succession both ways; or if the first, in one direction, become the last in the other.

Whenever two collieries send their coals down the same waggon-way, and that way a double one, then on the system of stages, each colliery may appropriate one of the ways to its own separate use; and

should it so happen, that these ways in particular places unite in one, the difficulty of entanglement of their chains may be easily done away, by each colliery having the drawing forward apparatus of its locomotive engine a few inches beyond their middle, towards the side most distant from each other; or it may be done by the method described in Fig. 3.

[137\*] Where coals from the same colliery are sent from different pits, some inconvenience, but easily superable, will arise at the junction of the branches. If this junction be at such distance from each pit as to make a stage, the whole process will be sufficiently easy from what has already been explained. If otherwise, let AB and CD, Fig. 5, denote the two branches and their junctions. The chain, if the locomotive engine travels to each pit, may previously to the arrival of the engine from the termination of the conjoint stage, be prepared without delay to its passage along any branch; it requiring only the means described in the explanation of Fig. II. which may be carried into effect during the absence of the engine. Or if the branch CD be short, the loaden waggons may be brought upon it close to the junction by horses, or other animal power, so as to be ready to be taken away by the engine, which previously to its doing so, may, by lengthening its track line, draw the light wagons into the bye-way or siding *g, h*, ready to be taken away from thence by the horses which bring the loaden ones.

To enlarge further on the methods necessary for change of conveyance along railways, would be superfluous, as the explanations are already sufficiently explicit for those conversant in them; and it is also obvious, that whenever expedient, one engine may be made to travel two or more stages, by simply uniting the chains at the ends of each stage.

There yet remains to be pointed out, the application of our method to high roads, which is more peculiarly suitable where the roads are tolerably level, and the materials for repairing them bad or expensive. If these roads be of suitable width, they may be left for general purposes, except a narrow space on one side, not much more than [138\*] the width of a foot path, which will answer for conveyance by alternate stages.

Fig. VI. shows the plan of an eligible road for this purpose, and Fig. VII. its profile or transverse section, in both of which the references are the same. 1, 1, are two parallel rows of *large* paving stones, of Scotch or other granite, at a suitable distance, for the tread of carriage wheels. 2, 2, ranges of hard smooth stones, or other substances, bevelled in their face, and rising three or four inches above the level of the pavement, so as to guide the carriage wheels from getting off the way. *c, d*, is a pavement over any cross road, with a groove in the middle



for the chain to fall into. The guide stones on each entrance from this cross-way, form the extrados or outside of a Gothic arch, both for the purpose of admitting carriages to quit the chain road at these places, and to direct them fairly on to it. These roads may pass through villages; but must necessarily pass by, or terminate at towns, in which case the terminations will be similar to one of the divisions of Fig. VI. and the locomotive engine must pass so far on to the pavement as to admit at least the foremost carriage of its train to be drawn off clear of the way. Then on the engine's return to its chain road, or even previously to it, the returning train of carriages may be fixed to its other end. As the engine may have appendages to clear away any impediments in the track of its wheels, and nothing can be thrown out of gear by its motion, it is evident that on a well-made chain road, it may travel, with its train of carriages, at the rate of 7 or 8 miles an hour. The preference of the road last described must depend on its comparative cheapness, because a tram-way, viz. one formed of flat iron rails, with a rising ledge, has, unless for very heavy carriages, superior advantages.

[139\*] Fig. VIII. shews a carriage of six wheels for the engine, which may rest equably, or nearly so, on each of its wheels, and move freely round the curves or past the angles of a railway. 1, 1, the fore pair of wheels, are, as usual on railways, fixed to the body of the carriage; 2, 2, and 3, 3, the other two pair, are fixed (on axles parallel to each other) to a separate frame, over which the body of the carriage should be so poised, as that two-thirds of its weight should lie over the central point of the four wheels, where the pivot 4 is placed, and the remaining third over the axis 1, 1. The two-thirds weight of the carriage should rest on conical wheels or rollers, bearing upon the curved plates *c, c*, so as to admit the ledges of the wheels, or those of the way, to guide them on its curves or past its angles, by forcing the transome or frame to turn on the pivot, and thus arrange the wheels to the course of the way, similarly to the carriage of a coal-waggon. And if the weight of the locomotive engine should require eight wheels, it is only requisite to substitute in place of the axis 1, 1, a transome, such as described (laying the weight equably upon both) and then similarly to two coal-waggons attached together, the whole four pair of wheels will arrange themselves to the curves of the railway.

In using locomotive steam or other engines for mines, there will be a want of draught for the fire under the boiler or air tubes, because of deficient height for the chimney or vertical flue; and also above ground, where necessary to pass under bridges, for high roads. We, in these instances of want of draught, attach to the locomotive engine the blowing apparatus of a common winnowing machine, to force a

current of air under the bars of the fire-place, which apparatus should of course receive its motion from the engine.

[140\*] We have also invented a method of using an endless chain of limited length, for travelling an unlimited distance, an eligible method of using which is shewn by the dotted lines annexed to Fig. 1, which have not been mentioned in the explanation of it; but which will now be described. A is a carriage of four wheels (suitable to the railway) supported on which is little 'a,' a short post or frame, with an eye bolt, or other point of connection with the end of a long spar, either of one piece, or framed hollow to make it light, and give it the power of lateral resistance; s, s, s, shew the outlines of this spar, which, accordingly to circumstances, may be 40, 50, or 60 feet long. One end of it, as already mentioned, is attached to the carriage A, which must be by a movable joint, and the other end, d, must be attached in a similar manner to the fore part of the locomotive engine; v, is a grooved wheel affixed to the carriage (shewn here for clearness at the tail of it, but which will be best in its centre) round which wheel the endless chain, shewn by the dotted lines, c, c, so far as it differs from the ground chain already described, passes and returns to the locomotive engine, supported and directed by the pullies u, u, some of which are attached to the spar, and others to the engine carriage. In this plan, the counter-action to the engine's power must evidently be the forks, 7, 7, which of course must be continuous throughout the whole line of progress, and with intervals suited to the distance between the carriage A, or rather its wheel, v, and the guide pulley, 2, of the locomotive engine. It is expedient, at least, that two of the forks, 7, 7, should have hold of the chain, and if they be five yards asunder, the spar, s, s, s, will be sufficient of fifty feet length; or if though eligible, two lengths of spar may be used with an intervening carriage of support. The peculiar advantages [141\*] and disadvantages of this method, compared with those of the ground chain, will depend on local and adventitious circumstances.

When a rope, or other flexible substance, is used in the place of a chain, it will be necessary that knots or protuberances should be formed on this substitute, wherever it shall be expedient for it to be held by the forks mentioned in the description of Fig. 1.

It is already known to the public, that self-acting locomotive engines have been used for the purposes of drawing carriages after them; but the object of this specification is not to include as our invention what has heretofore been publicly done, or granted to any preceding patentee, but simply to claim for the purposes explained, such position, application, and greater or less combination of the things mentioned, as falls within our description, so far as such combination has neither been

publicly carried into effect, or been included in the specification of any prior letters patent granted to any person or persons whomsoever.

In witness whereof, &c.

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#### OBSERVATIONS BY THE PATENTEES.

The plan, described in the preceding specification, for reducing the expense of conveying coals along railways, will shortly be carried into execution on the waggon-way from Heaton colliery to the river Tyne. A principal feature in the advantages to be derived from the adoption of this patent is, that no alteration is required in the waggon-ways, whether of wood or iron; because, if strong enough to sustain the coal waggons, which they necessarily must be, they will be amply capable of supporting the locomotive engine, when placed on six or [142\*] eight wheels, accordingly as its weight may require; and thus the alternative, hitherto labored under, will be obviated: *viz.* either that of the weight of the engine destroying numerous rails, or the total renovation of the way, by laying new rails, at a great charge.

Any gentleman disposed to carry this plan into effect, will receive every requisite information, on applying to Messrs. Chapman and Buddle, Newcastle upon Tyne.

## RESPONDENT'S EXHIBIT, No. 17.

## EXTRACTS FROM TREDGOLD'S TREATISE.

*Extracts from a Practical Treatise on Railroads, Carriages, &c. By THOMAS TREDGOLD, Civil Engineer, Member of the Institution of Civil Engineers, &c. London: Printed for Josiah Taylor, Architectural Library, 59 High Holborn, 1825.*

Page 93. "CARRIAGES for common railroads are made strong, to resist the shocks they are exposed to at every change of velocity, and it is necessary to make the parts which come in contact, solid pieces, extending a little more than the length of the body of the carriage, and hooped at the extremities, to prevent splitting; but carriages for passengers and for various kinds of goods, must be provided with springs to reduce the force of these shocks."

Page 94. "Small carriages must obviously be both heavier and more expensive, in proportion, than large ones. But as the stress on a wheel must be limited on a railroad, we cannot much enlarge the carriages without adding to the number of wheels.

## EIGHT-WHEELED CARRIAGES.

When a carriage has more than four wheels, the body must be sustained so that its pressure may be divided equally among the wheels. In the case where eight wheels are applied to support one body, if the body rests upon the wheel frame, of each set of four wheels, in the middle of its length; (see Fig. 26, Plate IV.) and is connected with those frames so as to allow the greatest possible change of level on the rails, it is obvious that each wheel must bear an equal pressure."

Page 95. "The load on each wheel must be limited to suit the strength of the rails; it will seldom exceed two tons on a wheel, nor be less than half a ton. The size of the axles may therefore vary from 2.2 inches to 3.5 inches. Perhaps the most advantageous load will be about 1 1-4 tons on each wheel, which will require an axis of three inches diameter."

Page 179. Plate IV. Fig. 26. A diagram to show how a wagon may be made with eight wheels, so that the stress of each wheel on the rails of a railroad may be equal. The body of the wagon rests on the wheel frames at AA, and is connected to them by an axis on which the frames turn, when from any inequality, the axes of the wheels are not in the same plane. See page 94. (*See Diagram.*)

Pages 12, 13. "The Hetton railway is one of the principal ones." "In some parts near the staiths we observed malleable iron rails, in 15 feet lengths, supported at every three feet, (see Figs. 9 and 10.) They are 3½ inches deep in the middle between the supports, and 2¼ inches in breadth at the upper surface; one yard in length weighs about 28 lbs.

The wheels of the coal wagons are 2 feet 11 inches in diameter, with 10 spokes, and weigh 2 3-4 cwt.; and their axles are 3 inches in diameter, and revolve in fixed bushes."

"The weight of the engine is about eight tons, (see Fig. 2, Plate I.)"



"The boiler is supported on the carriage by four floating pistons, which answer the purpose of springs in equalizing the pressure on the wheels, and softening the jerks of the carriage."

Pages 118, 119, 120, 121. "The extent of land required for a railroad must depend on the breadth and number of the tracks. The breadth of the track has rather been determined by opinion, than as a question arising out of the circumstances of the case. But it must be obvious, that the breadth of the track ought to have some relation to the height of the load, in order that the carriage may be always in stable equilibrium on the rails; and in railroads there is another circumstance to be considered, the pressure on the rails should not be materially altered by any slight depression of one side of the road. It may be taken as a general rule for the width between the rails for carriages travelling at a greater speed than five miles per hour, that the centre of gravity should not be higher in proportion to the breadth between the rails than as 1 is to  $1\frac{1}{2}$ ; but they are often so constructed that the height of the centre is equal, or nearly equal, to the breadth between the rails; and with this proportion, in slow motions, no ill consequences may probably occur; but in rapid motions the centre of gravity must be kept at least within the limits we have mentioned, or there will be much risk of the carriage being overthrown by a very small obstruction. On a common road, the great resistance at the surface of the wheels, and the force of the moving power, tend to keep the carriage from upsetting; but on a railway, the smallness of the moving force and little increase of resistance to the wheel which takes the stress, render them insufficient to balance the momentum the carriage acquires by striking on an obstruction; besides, the connection of the moving force is not so favorable for drawing the carriage back to its position. All these circumstances demand the serious attention of the engineer who has to conduct a railway where the carriages are to proceed at the rate of ten miles an hour.

"The width between the rails being therefore dependent on the height of the centre of gravity of the loaded carriages, and this again varying with the nature of the load and the velocity, it will be obvious we cannot do better than make the breadth between the rails such, that by disposal of the load, the centre of gravity may be kept within the proper limit in either species of vehicle, whether swift or slow. And it would be desirable that the same breadth and the same stress on a wheel should be adopted in all railways. We would propose four feet six inches between the rails for heavy goods, and six feet for light carriages, to go at greater speed." "In all railroads it is necessary that there should be passing-places at certain parts of the road, and in single tracks they should be very frequent."

Page 127. "Example. If the distance of the supports be three feet," &c.

Page 130. "If the distance of the supports be three feet," &c.

Page 126. "The distance between the wheels of the carriages should be such that the unsupported part of a rail should have to carry only one wheel."

Page 133. "Now, it is obvious that if any support be incapable of sustaining half the weight of the wagon without injury, it is insufficient for the purpose; consequently if the supports be ever so numerous, the

same degree of firmness becomes necessary, as if they were at a great distance apart."

Page 101. "In proportioning the body of a carriage, it should be kept in view that the load should be as low as possible."

Page 173. "For carriages on springs, and steam carriages, consider the stress," &c.

Page 174. "Where the heaviest carriages are on springs, or floating pistons, two-thirds of the actual load on each wheel may be considered the stress on the rail for ordinary purposes," &c.

Page 12. "The Hetton railway is one of the principal ones." "The rails of the straight parts of the railway weigh 61 lbs. each; but this was found to be too slight for the curved parts, therefore the strength of the latter has been increased," &c.

Page 135. "When a considerable degree of curvature is given to a railroad, the rails of the outer curve should have a slight rise to the middle of the curve, and the rails should be stronger in a lateral direction in both lines. The object in making a slight ascent to the middle of the curve of the outer rail, is to counteract the tendency of the carriage to proceed in a straight direction, without its rubbing so forcibly against the guides as we have observed in cases where roads have had a considerable curvature."

Pages 42, 43. "It often happens, that a great part of the resistance at the rails arises from the lateral rubbing of the guides of the wheels; therefore it is desirable to give the wheels a tendency to keep in their path with as little assistance from the guides as possible.

"For edge-rail carriages this may be accomplished by making the rims of the wheels slightly conical, or rather curved, as shown in Fig. 24; the carriage will then return of itself to its proper position on the rails, if it be disturbed from it by any irregularity."

## RESPONDENT'S EXHIBIT, No. 18.

## LIVERMORE'S LETTERS PATENT, &amp;c.

To be annexed to the 10th Additional Direct Interrogatory to Samuel Cooper, Deponent. B. F. HALLETT, *Commissioner*

THE UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting :

This is to certify, that the annexed is a true copy from the records of this Office, of Letters Patent issued to Lorenzo D. Livermore, on the eleventh day of November, eighteen hundred and fifty-one.

In testimony whereof, I, Charles Mason, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this ninth day of January, in the year of our Lord one thousand eight hundred and fifty-four, and of the Independence of the United States the seventy-eighth. C. MASON.

[L. S.]

THE UNITED STATES OF AMERICA.

TO ALL TO WHOM THESE LETTERS PATENT SHALL COME :

Whereas, Lorenzo D. Livermore, of Hartland, Vermont, has alleged that he has invented a new and useful improvement in coupling Railroad cars, which he states has not been known or used before his application; has made oath that he is a citizen of the United States, that he does verily believe that he is the original and first inventor or discoverer of the said improvement, and that the same hath not, to the best of his knowledge and belief, been previously known or used; has paid into the treasury of the United States the sum of thirty dollars, and presented a petition to the Commissioner of Patents, signifying a desire of obtaining an exclusive property in the said Improvement, and praying that a patent may be granted for that purpose.

These are therefore to grant, according to law, to the said Lorenzo D. Livermore, his heirs, administrators, or assigns, for the term of fourteen years from the eleventh day of November, one thousand eight hundred and fifty-one, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement, a description whereof is given in the words of the said Livermore, in the schedule hereunto annexed, and is made part of these presents.

In testimony whereof, I have caused these Letters to be made Patent, and the seal of the Patent Office has been hereunto affixed.

{ L. S. } Given under my hand at the City of Washington, this eleventh day of November, in the year of our Lord one thousand eight hundred and fifty-one, and of the Independence of the United States of America the seventy-sixth.

ALEX. H. H. STUART, *Secretary of the Interior.*

Countersigned and sealed with the seal of the Patent Office.

THOS. EWBANK, *Commissioner of Patents.*

## SCHEDULE

*Referred to in these Letters Patent, and making part of the same.*

To all whom it may concern :

Be it known that I, Lorenzo D. Livermore, of Hartland, in the County of Windsor, and State of Vermont, have invented a new and improved mode of coupling railroad cars, and guiding the trucks of the same; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings making a part of this specification. The nature of my invention consists, first, in the combination of a stiff coupling with the ends of two cars, and with the trucks under them, in such a manner that the position of the cars upon a track, will guide the trucks and keep them at all times in their proper positions upon the track; to wit,—with the axles of the trucks at right angles to any straight track, and at right angles to the tangent of any curved railroad track, which arrangement greatly reduces the amount of wear and tear of the flanches of the wheels upon the rails—and thereby greatly increases their durability: and what is of much greater importance, my said improved method of car coupling and truck guiding, renders it impossible for a car to run off the track.

In the accompanying drawings, [see Drawing] Fig. 1, is a plan or top view of a curved railroad track, with the trucks of two cars resting upon it; Fig. 2, a side elevation of a truck and section of a car resting upon a track; and Fig. 3, a longitudinal vertical section of a car coupling detached.

Similar letters indicate like parts in all the figures.

The cars are represented by the beams *a, a*, which rest upon and connect each pair of trucks, by means of the ring bolts, *f, f*. Each coupling is composed of a flat draught bar *e*, enclosed in a casing *b*, as represented in Fig. 3.

The said casing *b* has a flaring mouth *k*, at its outer end, which leads into cavities *m, m*, formed above and below the draught bar, for the reception of the outwardly projecting end or tongue of the coupling of the car to be connected to.

Where two cars are brought together, the projecting tongue from the coupling on either car may pass above or below the tongue of the coupling on the other car, into either of the receptacles *m*, prepared for it. The couplings are united to each other by a bolt *j*, (Fig. 3,) inserted into either of the holes *i, i*, Fig. 1: and when two couplings are united to each other, they are firm and unyielding. The draught bar *e*, of a coupling, is connected to a car at the point *g*, by any suitable joint or contrivance that will admit of the necessary movements, and it—the said draught bar—is also connected to the truck under that end of the car, by the angular lever *c, c*, which projects outwardly from the transverse beam *d*, of the truck, and is connected to the draught bar of the coupling at the point *h*, by means of a rivet or bolt secured to one and working in a slot in the other, or by any other suitable joint that will admit of the requisite movements. The position of the said point *g*, must be governed by the position of the point *h*, and *vice versa*: and the positions of the two points *g* and *h*, must be so governed that when



the connections are all complete, and two or more cars coupled together, the axles of the trucks will be in positions at right angles to any straight track, and at right angles to the tangent of any curved railroad track over which they may pass. The following is a formula or statement by which the relative distances between the points of attachment may be determined. Let  $a$  represent the distance from the face of the coupler, on Fig. 1, to point  $h$ ;  $b$ , the distance from the point  $h$  to the point  $g$ ;  $c$ , the distance from the point  $g$  to  $f$ ;  $d$ , the distance from king bolts or points  $f, f$ , of the same car; then as twice  $(a + b + c)$  is to  $d$ , so is  $c$  to  $b$ .

What I claim as my invention, and desire to secure by letters patent, is the combination of a stiff car coupling with the ends of a couple of cars and with the trucks under the same: substantially in the manner herein set forth; by which the cars are made to guide the trucks under them, and keep them in their proper positions on the track; to wit,—in such positions that a line drawn midway between and parallel with the truck axles, will be at right angles to any straight track, and also at right angles to the tangent of any curved railroad track.

LORENZO D. LIVERMORE.

Witnesses—MARTIN BUCK,  
GEO. W. POST, Jr.



## JUDGMENT RECORD.

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THE SCHENECTADY AND TROY RAILROAD COMPANY  
*adsm.* ROSS WINANS.

NORTHERN DISTRICT OF NEW YORK—SS.

The Schenectady and Troy Railroad Company were summoned to answer Ross Winans in a plea of trespass on the case, and thereupon Ross Winans, by Hamilton Harris, his Attorney, complains of the Schenectady and Troy Railroad Company in a plea of trespass on the case. For that, whereas the said Plaintiff, so being a citizen of the United States as aforesaid, and being the original and first inventor of a new and useful improvement in the construction of cars or carriages intended to run upon railroads, which was not known or used before his invention, and which, at the time of his application for a patent, as hereinafter mentioned, was not in public use or on sale, with his consent or allowance, and thereupon heretofore, to wit, on the 1st day of October, 1834, at the City of Washington, to wit, at the city of Albany, in the county of Albany, and in the said Northern District of New York, upon the application of the said Plaintiff to the Secretary of State of the United States, letters patent were duly issued in the name of the United States, under the seal of the United States, signed by the President of the United States, and by the Secretary of State of the United States, to which was subjoined a certificate of the Attorney General of the United States, that on the 1st day of October, 1834, he had examined the said letters patent, and that the same were conformable to law, which said letters patent, bearing date the same day and year last aforesaid, duly signed, issued, recorded and tested as aforesaid, according to the form of the statute in such case made and provided, the said Plaintiff now brings here into Court, wherein and whereby was granted to the said Plaintiff, his heirs, administrators or assigns, for the term of fourteen years from the said 1st day of October, 1834, the full and exclusive right and liberty of making, constructing, using and vending to others to be used, the said improvement, a description whereof in the words of the said Plaintiff himself, is contained in a schedule or specification annexed to the said letters patent, and forming part thereof of the tenor and import following, to wit: (For Specification see pp. 3—427\*.)

As by reference to the said schedule or specification annexed to the said letters patent, and which the said Plaintiff now brings here into

Court, will more fully appear; and the said Plaintiff in fact further says, that, by means of the said letters patent, he, the said Plaintiff, became and was at the time of the committing of the grievances hereinafter mentioned, to wit, the 1st day of July, 1846, entitled to the exclusive right and liberty of making, constructing, using and vending to others to be used, the said improvement in the construction of cars or carriages intended to run upon railroads, in the said letters patent specified, for the term of years specified in the said letters patent, which said exclusive right and liberty has been, and now is, of great value to him, the said Plaintiff, to wit, of the value of \$20,000.

Yet the said Defendant, well knowing the premises, but contriving and wrongfully intending to injure the said Plaintiff, and to deprive him of the profits, benefit and advantages which he might, and otherwise could have derived and acquired from the exclusive right and liberty aforesaid, did, on the 1st day of July, 1846, and on divers other days and times before and afterwards, and during the said term of fourteen years mentioned in the said letters patent, and which the said Plaintiff was so entitled to the said exclusive right and liberty as aforesaid, and before the commencement of this suit, to wit, at Troy, in the said Northern District of New York, unlawfully and unjustly, and without the consent or allowance, and against the will of the said Plaintiff, having previously made, or caused to be made, the said new and useful invention, did use the same and put the same in practice in breach of the aforesaid letters patent, and in violation and infringement of the right, privilege and liberty, so as aforesaid granted to the said Plaintiff, and contrary to the form and effect of the statute in such case made and provided, whereby the said Plaintiff has been injured and deprived of great profits and advantages which he might, and otherwise he would, have received from said invention, and has sustained actual damage to the amount of \$5000, and by force of the statutes aforesaid, an action has accrued to the said Plaintiff to recover the said actual damages and such additional amount, not exceeding in the whole three times the amount of such actual damage as the Court may see fit to order and adjudge, and therefore the said Plaintiff brings suits, &c.

And the said Defendants the Schenectady and Troy Railroad Company, by Robert Christie, Jr., their attorney, come and defend the wrong and injury, when, &c., and say that they are not guilty of the several grievances laid to their charge in the declaration of the Plaintiff, in this cause in manner and form as is therein alleged, and of this they put themselves upon the country, and the said Plaintiff does the like, &c.

And it is suggested to the said Court, before the Judges thereof, that the said Defendants, under their said plea aforesaid, gave notice of special matter as follows, viz:

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\* The numbers with a Star (\*) indicate Complainant's folios.



## UNITED STATES CIRCUIT COURT.

NORTHERN DISTRICT OF NEW YORK.

THE SCHENECTADY AND TROY RAILROAD COMPANY, *ads.* ROSS WINANS.

SIR :—On the trial of the above cause, the Defendant, under the plea of the general issue heretofore served on you, will give in evidence pursuant to the statute in such case made and provided, that the alleged improvement in the construction of cars or carriages, intended to run on railroads, specified and claimed by the Plaintiff in his declaration, patent and specification, was known and used with the consent and approbation of the Plaintiff before the date of his said patent or his application therefor, by the Hudson and Mohawk Railroad Company, and by the Saratoga and Schenectady Railroad Company, the former at Albany and the latter at Schenectady, in the State of New York; by the Morris Canal Company, in the State of New Jersey; by the Newcastle and Frenchtown Turnpike, and said Road Company in the States of Maryland and Delaware; by the Baltimore and Ohio Railroad Company, by the Baltimore and Washington Railroad Company, a branch of the Baltimore and Ohio Railroad Company; by the Baltimore and Susquehannah Railroad Company; by the Baltimore and York Railroad Company, in the State of Maryland; by the Wilmington Railroad Company, in the State of Delaware; and by the South Carolina Canal and Railroad Company, in the State of South Carolina.

And also that each and every of said Companies, their officers, and servants and agents, had a knowledge of said alleged improvements before the discovery or invention of the Plaintiff, and before the application of the said Plaintiff for his said patent; and used the same on their several and respective canals and railroads, to wit:—the said Morris Canal Company, at Morrisville, in the State of New Jersey; the said Hudson and Mohawk Railroad Company at Albany, and between Albany and Schenectady; the said Saratoga and Schenectady Railroad Company, between Schenectady and Saratoga Springs; the Newcastle and Frenchtown Turnpike and Railroad Company at Newcastle and Frenchtown and between those places; the Baltimore and Ohio Railroad Company; the Baltimore and Susquehannah Railroad Company; the Baltimore and York Railroad Company, at and between the above places; the Wilmington Railroad Company, at Wilmington; and the South Carolina Canal and Railroad Company, on their Canal and Railroad in that State; and also that the said Companies, their officers, servants and agents, knew and used said alleged improvements at their known and accustomed places of running their cars and doing their business; and also that the aforementioned Canal and Railroad Companies respectively used said invention at the several places aforesaid and on their canals and railroads, between the termini of their several canals and railroads, before Plaintiff's discovery and application for his patent.

And you will also take notice, that, on the trial aforesaid, the Defendant will further give in evidence, that one Ephraim Morris, of New Jersey, prior to the said alleged invention, invented and discovered an improvement in the construction of wheels for carriages, to wit: on the 13th day of October, 1829, in all material and substantial parts like the

one claimed by said Plaintiff as his invention and discovery, and obtained, among other things, a patent therefor, bearing date the day and your (?) last aforesaid.

And you will also take notice, that the Defendant will prove that the following persons had a knowledge of, and used said Plaintiff's pretended improvement, prior to his pretended invention and discovery, to wit: Ephraim Morris, on the Morris Canal, in the State of New Jersey; Asa Whitney, Matthew H. Baldwin and James B. Jones, at the city of Albany; James Stimson and John C. A. Smith, at Philadelphia; M. Rogers, engine builder at Patterson, New Jersey; James B. Dorsey, Isaac Knight, Robert S. Hollins, J. Canduce Gatch, Reuben Aler and Jacob Rupp, at Baltimore, while performing mechanical labor for the said Ohio and Baltimore Railroad Company, on the said railroad; by Isaac R. Trimble and Richard Finlay, at Philadelphia or Baltimore, or at one or both of those places.

And you will also take notice, that the Defendants will also prove that the said alleged discovery and invention of the said Plaintiff, and the material and substantial parts thereof, had been discovered by Thomas Tredgold, in a printed publication printed and published in the city of New York, in the year 1825, by E. Bliss and E. White, and that a description thereof had been given in the Railroad Journal, also in a book printed and published in the United States prior to said alleged invention and discovery of said improvement, to wit, in vol. 1, for August, 1832, and for March, 1832; in vol. 2 of the same work for November, 1833; in a work on railroads by Mr. Wood, printed and published in 1825, and also in a work by Mr. Squazine, Civil Engineer, on Railroad Carriages, printed and published in 1828, and also the Report of the Committee of the South Carolina Central Railroad Company, published in the Railroad Journal, 2d vol. for 1833.

And you will also take notice, that the Defendant on trial will also give in evidence, that the description in the specification of the said Plaintiff does not contain the whole truth relative to the aforesaid invention and discovery; and that it contains more than is necessary to produce the desired effect; and that it does not contain such information and direction as to enable those acquainted with the sciences with which it is most nearly connected, to construct such improvement in cars and carriages; and also that the said alleged improvement had been described in printed publications in England and the United States, anterior to the supposed discovery thereof by the Plaintiff; and also that the same improvement had been in public use and on sale, with the consent and allowance of the said Plaintiff; before his application for a patent; and that the said Plaintiff is not the first and original inventor or discoverer of the said thing patented, &c. Yours, &c.,

ROBERT CHRISTIE, JUN., *Def'ts Attorney.*

To H. HARRIS, Esq. *Plaintiff's Attorney.*

## CIRCUIT COURT OF UNITED STATES.

FOR THE NORTHERN DISTRICT OF NEW YORK.

THE SCHENECTADY AND TROY RAILROAD COMPANY, *ads.* ROSS WINANS.

Sir:—In addition to the notice heretofore given, further notice is hereby given under the plea of the general issue, pursuant to the provisions in the act of Congress, that on the trial of the above entitled suit, the Defendants will prove and give in evidence, that the alleged improvement in the construction of cars or carriages intended to run on railroads, specified and claimed by the Plaintiff in his declaration, patent and specification, were known to the following persons, in addition to the persons mentioned in the former notice, previously to the pretended invention and discovery thereof by the Plaintiff, and previous to his application for his said patent, viz: Thomas Robinson and Lucian M. Chase, of Newcastle, in the State of Delaware, and John C. A. Smith of Baltimore; and that the said persons used the said improvements, or some of them and at some one or more of the places, and on one or more of the railroads mentioned in the former notice, served on the Plaintiff's Attorney in this cause. Yours, &c.,

ROBERT CHRISTIE, JR., *Def'ts Attorney.*To H. HARRIS, Esq., *Attorney for Plaintiff.*

## CIRCUIT COURT OF THE UNITED STATES.

FOR THE NORTHERN DISTRICT OF NEW YORK.

THE SCHENECTADY AND TROY RAILROAD COMPANY *adsm.* ROSS WINANS.*Further Notice, Special Matter.*To HAMILTON HARRIS, Esq., *Plaintiff's Attorney.*

Please further to take notice that on the trial of the above entitled cause, the Defendants will give in evidence, pursuant to the act of Congress, passed July 4th, 1836, entitled, "An act to promote the progress of useful arts, and to repeal all acts, or parts of acts, heretofore made for the purpose;" that John B. Jervis, now or late of the city of New York, Civil Engineer, Asa Whitney, of the city of Philadelphia, E. P. Williams, of the city of Auburn, William C. Young, now or late of the city of Schenectady, and John Wilkinson, of the city of Syracuse, previously to the pretended invention by the Plaintiff, of the improvements described in his specification set forth in the declaration in this cause, and before he applied for his patent in said declaration mentioned, had, and each of the before named persons had knowledge of the things claimed by said Plaintiff, in his said patent and specification, as his improvements and invention, or of material and substantial parts thereof, at the city of Albany, the city of Schenectady, and other places mentioned in the former notice, and had, and each of them had used the same, or seen the same used on the Mohawk and Hudson Railroad, also on the Saratoga and Schenectady Railroad, also on the Utica and Schenectady Railroad, at the termination of these respective roads, and along the lines of said railroads, or upon one or more of said Railroads, and also upon the several other railroads, mentioned in the former notices in this cause, or some of them.

Also take notice that James B. Dorsey, formerly of Newcastle, in the State of Delaware, and now or lately in the employ of the Baltimore and Ohio Railroad at or near Baltimore; Robert S. Hollins, Camden Gates, Reuben Aler, Jacob Ruff, (?) Isaac Knight, of Baltimore, in the State of Maryland, and Richard Imlay, of the city of New York, previously to the Plaintiff's pretended invention, and before his application for his said patent, had and each of them had, knowledge of the things claimed by the said Plaintiff as his invention and improvement, or of material and substantial parts thereof, at Baltimore, in the State of Maryland, and at the other places mentioned in the former notice, and had each of them used the same, or seen the same in use before the Plaintiff's pretended invention thereof, and before his application for his said patent, upon the Baltimore and Ohio Railroad, the Baltimore and Washington Railroad, the Newcastle and Frenchtown Railroad, and the several railroads mentioned in the notice heretofore given in this cause.

Also take notice that Ephraim Morris, formerly of New Jersey, and now supposed to be a resident of the city of New York, the person mentioned in a notice heretofore given in this cause previous to the Plaintiff's pretended invention, and before his application for his said patent, had knowledge of the things claimed and patented by the said Plaintiff as his invention and improvements, or of some substantial and material parts thereof, and used the same, or saw the same in use on the Morris Canal, in the State of New Jersey; and on the several railroads, or some of them, mentioned in the notice heretofore given.

Yours, &c., ROBERT CHRISTIE, JR.,  
*Attorney for Defendants.*

CIRCUIT COURT OF THE UNITED STATES,  
FOR THE NORTHERN DISTRICT OF NEW YORK.

THE SCHENECTADY AND TROY RAILROAD COMPANY *adsm.* ROSS WINANS.

To HAMILTON HARRIS, Esq., *Attorney for Plaintiff.*

Please to take notice, that in addition to the special matters of which notice has been heretofore given, the Defendants will, on the trial of this cause, give in evidence and prove that the things patented by the Plaintiff, previously to his supposed invention or discovery thereof, and before he applied for his said patent in the declaration mentioned, were in public use on the Mohawk and Hudson Railroad, in the counties of Albany and Schenectady, and on the Saratoga and Schenectady Railroad, in the counties of Saratoga and Schenectady; that bearing carriages or trucks constructed on the same principle and embracing the supposed improvement and invention for which the said letters patent were granted to the said Ross Winans, was, previously to the year 1834, and before the said Ross Winans applied for his said patent, in public use on the Mohawk and Hudson Railroad, under certain locomotives called the John Bull and the Experiment, and on the Saratoga and Schenectady Railroad, under the locomotives called the David or Davy Crockett; and such public use was known to the following persons, among others, to wit: Asa Whitney, now of the city of Philadelphia, John B. Jervis, of the city of New York, William C. Young, now



or late of the city of Schenectady, E. P. Williams, of the city of Auburn, and John Wilkinson, of the city of Syracuse.

Also please further to take notice, that the Defendant will give in evidence, that the supposed improvements and inventions claimed in said letters patent granted to the said Ross Winans, were, long previously to his supposed invention and discovery thereof, and before he applied for his said patent, described in the following public works, namely: in the Repository of Arts, Manufactures and Agriculture, vol. 24th, second series, published in London in the year 1814, pages 129 to 139. Also, in a public work entitled a Practical Treatise on Railroads and Carriages, by Thomas Tredgold, published in the city of New York, in the year 1825, chapter fifth of said Treatise. Also in a public work, entitled, "A practical Treatise on Railroads, and Interior Communications in General, by Nicholas Wood, published in London in the year 1825, pages 154 to 157, and plates therein referred to.

Yours, &c.,      DAVID BUEL, JR.,  
*Attorney for Defendants.*

And thereupon the process thereof is continued between the parties aforesaid, of the plea aforesaid, in this same Court, before the Judges thereof, until the first Tuesday after the third Monday in June, of the term of June, 1850; and the said issue above joined, is ordered by the said Court to be tried at the Circuit Court, appointed to be held at the Court House in the village of Canandaigua, in and for the Northern District of New York, on the said 18th day of June, 1850.

At which time and place last above mentioned, before Hon. Alfred Conkling, District Judge of the Northern District of New York, and one of the Judges of said Court, came, as well the above named Plaintiff, as the above named Defendant, by their respective Attornies above mentioned, and the jurors of the Jury summoned to try the said issue, being called, also came; who, to speak the truth of the matters aforesaid, being chosen, tried and sworn, say, upon their oath, that the said Defendants are guilty of the premises above laid to their charge in manner and form as the said Plaintiff hath above complained against them. And they assess the damages of the said Plaintiff, by reason of the premises, over and above his costs and charges by him, about his suit in this behalf expended, to one hundred dollars, and for the cost and charges to six cents.

And hereupon the said Plaintiff suggests that the said Defendants made and served a case, and gave notice of motion for a new trial thereupon.

And hereupon the process thereof is continued between the parties aforesaid, of the plea aforesaid, in this same Court, before the Judges thereof, until the first Tuesday after the third Monday in June, of the term of June, 1851.

And now, at this day, to wit, the 3d day of September, 1851, all and singular, the premises being seen and by the Court here fully understood, and mature deliberation being thereupon had, it appears to the said Court that the verdict aforesaid, of the jurors aforesaid, in form aforesaid given, is in all respects, good and valid in law, anything to the contrary thereof in anywise notwithstanding. Therefore it is considered that the said Plaintiff do recover against the said Defend-

ants, his said damages, costs and charges, by the jurors aforesaid, in form aforesaid assessed, and also six hundred and sixty-one dollars and twenty-two cents for his said costs and charges by the said Court now here adjudged, of increase to the said Plaintiff and with his assent; which said damages, costs and charges, in the whole, amount to seven hundred and sixty-one dollars and twenty-eight cents.

And the said Defendants in mercy, &c.

Judgment signed this 13th day of October, 1851.

A. A. BOYCE, *Clerk.*

Filed Oct. 13th, 1851.

UNITED STATES OF AMERICA, NORTHERN DISTRICT OF NEW YORK, ss.

I, Augustus A. Boyce, Clerk of the Circuit Court of the United States of America for the Northern District of New York, in the Second Circuit, do hereby certify that the preceding is a true copy of a Judgment Record on file in this office.

In testimony whereof, I have hereunto subscribed my name and affixed the seal of the said Court, at Utica, this 20th day of October, eighteen hundred and fifty-one, and of the Independence of these United States the seventy-sixth.

AUG. A. BOYCE.

Fees \$7,44; paid by C. D. Gould, Esq., for Ross Winans.

A. A. BOYCE, *Clerk.*

UNITED STATES OF AMERICA, NORTHERN DISTRICT OF NEW YORK, ss.

I, Nathan K. Hall, one of the Judges of the Circuit Court of the United States for the Northern District of New York, do hereby certify that I am well acquainted with the hand-writing of Augustus A. Boyce, whose name is subscribed to the above certificate, and that the signature to the same is in his proper handwriting. And I do further certify that he was, at the time of signing the same, Clerk of the Circuit Court of the United States of America for the Northern District of New York

Dated Dec. 8, 1853.

N. K. HALL.

*Circuit Court U. S., Massachusetts District.* Filed in the Clerk's Office, Jan. 17, 1854.

Attest :

H. W. FULLER, *Clerk.*

## CASE.

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### CIRCUIT COURT OF THE UNITED STATES,

FOR THE NORTHERN DISTRICT OF NEW YORK.

THE SCHENECTADY AND TROY RAILROAD COMPANY, *adversus* ROSS WINANS.

This is an action for the infringement of a patent granted to the Plaintiff on the 1st of October, 1834, for an improvement in the construction of cars or carriages intended to run on railroads. The suit was commenced on the 14th July, 1847.

Either party may refer to the pleadings and notices on the argument.

The action was tried at the term of the Circuit Court of the United States, at the court house in Canandaigua, which commenced on the 18th day of June, 1850, before the Hon. Alfred Conkling, District Judge of the Northern District of New York, and one of the judges of said Court, and before a jury of the county of Canandaigua.

The Plaintiff gave the following evidence to support the issue on his part, viz: A patent for a new and useful improvement in the construction of cars or carriages intended to run on railroads, dated 1st October, 1834, being the same set forth in the declaration. The patent was recorded anew the 7th of June, 1837, as appeared by a memorandum to that effect endorsed on said patent. No drawings were attached to it, nor was there any reference in the patent to any drawings. A copy of the patent and specification, and of said memorandum of their record anew, is annexed to this case marked Exhibit, No. 1, on the 25th September, 1848. The patent was extended for seven years from the 1st October, 1848, as appeared by a certificate of extension endorsed on said patent, of which certificate a copy is set forth in said Exhibit, No. 1.

The Plaintiff then offered in evidence a certified copy from the Patent Office of said patent, said specification and said certificate of extension, and of a certain drawing, and of certain written references to said drawing, and of an affidavit made by the Plaintiff, November 19, 1838. The said copy of said patent, specification, and certificate of extension, was in the same words as is set forth in said Exhibit, No. 1. The said certificate from the Patent Office, and the said copy thereto annexed of said drawing, said written references and said affidavit, were in the words and figures as set forth in Exhibit, No. 2, hereto annexed.

The drawing was not filed at the time the patent was recorded anew, but was filed on the 19th November, 1838.

The Defendant's counsel objected to the evidence offered, because

*first*, it appeared that no drawing was annexed to the original patent; *second*, that the act of Congress does not make such a drawing as this evidence. The judge overruled the objection and admitted the evidence, to which the Defendant's counsel excepted.

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The following Depositions, taken on the part of the Plaintiff, were then read in evidence:

### DEPOSITION OF PHILIP E. THOMAS.

WINANS vs. THE TROY AND SCHENECTADY RAILROAD COMPANY.

PHILIP E. THOMAS, a witness on the part of the Plaintiff:

1. Are you acquainted with Ross Winans, the Plaintiff in the above cause? and, if yea, how long have you known him?

To the first interrogatory he answers: That he is acquainted with the said Ross Winans, the Plaintiff in said cause, and has known him since very nearly the commencement of the Baltimore and Ohio Railroad.

2. Were you any time President of the Baltimore and Ohio Railroad Company? and was Ross Winans in the service of said Company, and what were his duties and the terms of his employment?

To the second interrogatory he answers: That he was the President of the said Railroad Company from the organization thereof, in the year 1827, until the year 1836; that said Ross Winans was in the service of the said Baltimore and Ohio Railroad Company during the period this affirmant was President, and his duties were the improvement and perfection of the machinery proper to be put on the railroad, for which he received, as witness believes, a salary of \$1500 a year. The Company were to have the benefit of any discoveries or inventions he might make without charge, he having the benefit of the Company's shops, their road to make experiments and try the machinery on, and the use of the Company's materials. There was a period when his salary ceased, but he cannot now recollect the period, or whether it was when witness was President, or subsequently, when witness was a Director.

3. Under whose supervision and upon whose plan, if you recollect, was the eight-wheel car put upon the Baltimore and Ohio Railroad?

To the third interrogatory he answers: That the first eight-wheel car was put upon the road during the time said Ross Winans was in the employment of the said Company, and it was under his supervision, as affirmant recollects and believes. It is a very difficult question for affirmant to answer, on whose plan the said car was put on the road, but affirmant's impression is, that it was upon the suggestion of said Winans.

4. If you recollect the name of the first eight-wheel car put on the said railroad, please to mention it, and, if in your power, describe the construction.

To the fourth interrogatory he answers: That he believes the first eight-wheel railroad car put on said railroad was called the Columbus. As far as affirmant knows, there had been no eight-wheel car used at that time. The Company had no plan upon which to con-



struct them, and therefore, in order to ascertain what would be a suitable and convenient plan, they constructed cars on several plans as regarded their arrangement for the accommodation of passengers, and affirmant does not precisely recollect on which plan the Columbus was constructed. Affirmant refers in the above answer to the bodies of the cars.

1. Additional interrogatory.

To what were your duties as President of the said Company especially directed? Did they extend to the supervision of the Department of Machinery, or was that confided to others, and if so, to whom was it confided?

JNO. B. LATROBE, *for Plff.*

To the additional interrogatory by Plaintiff he answers: That the details of the business of the Company were divided into departments. The business of the company was complicated, and ramified itself into many different branches. Affirmant's duty was to preside at the meetings of the Board of Directors; to receive the reports monthly and submit them to the Board; to attend to the general financial affairs of the Company, and conduct the correspondence; and to have a general superintendence of its concerns. To the best of his recollection, George Gillingham was the Superintendent of Machinery.

(Signed,)

P. E. THOMAS.

*Cross-Interrogatories to be propounded to Philip E. Thomas, a witness on the part of the Plaintiff.*

1. Can you state more precisely the duties and office of the Plaintiff, Ross Winans, during his connection with the Baltimore and Ohio Railroad Company during your Presidency, than you have already stated?

To the cross-interrogatories by the Defendant, he answers: To the first cross-interrogatory he answers, that the Plaintiff had no other duties but what he has stated, that he knows of.

2. Did Mr. Winans' appointment give him the control and management of the machine shops, during that period of time? or was there not a Superintendent of Machinery of said road?

To the second cross-interrogatory, he answers: That upon the organization of the said Company, the duties of the service were divided into several departments. There was a Board of Engineers, whose duty it was to plan and locate the road. There was a Superintendent of Construction, whose duty it was to lay the timbers on the road and make it. There was a Superintendent of Masonry, whose duty it was to build the stone bridges. There was a Superintendent of Machinery, but affirmant does not distinctly recollect whether the Plaintiff was that Superintendent or not.

3. In your answer to the third interrogatory in chief, do you refer to an eight-wheel passenger car, or to all eight-wheel cars for any or all purposes?

To the third cross-interrogatory he answers: That his impression is, that the first eight-wheel car put on the road, was a passenger car, and that after that, the Company went on to put other eight-wheel cars on the road.

4. Can you state from recollection, whether the wheels and run-

ning gear of the first eight-wheel passenger car was of Winans' construction and plan, and that no other person or persons connected with the Company made suggestions in regard to such plan or construction?

To the fourth cross-interrogatory he answers: That he cannot answer this question, for he does not know who Winans may have conferred with, or who may have made suggestions to him, or whether he conferred with or received suggestions from any one.

5. When you state that your impression is, that the plan of the body of the eight-wheel passenger car, called Columbus, was made upon the suggestion of Winans, what is the full extent of your information on that subject?

To the fifth cross-interrogatory he answers: That he is not aware that he has made such a statement, as that the plan of the body of the eight-wheel car was made on the plan of Winans.

6. When you speak of the suggestion of Winans, in connection with placing an eight-wheel passenger car on the road, do you mean to say that the plan of construction of the body, or the running gear was that of Winans', or that an eight-wheel passenger car was put on the road at his suggestion?

To the sixth cross-interrogatory he answers: That he means to say, that in speaking of the eight-wheel cars, he refers to the running machinery. As to the body, a carpenter could do that. He refers to the running gear.

7. Was there any running gear composed of eight wheels used for transportation of timber or other articles on said road, before the construction of the Columbus?

To the seventh cross-interrogatory he answers: That none was used that he is aware of.

8. How often did you see Winans engaged in the construction of an eight-wheel passenger car, or superintending its construction?

To the eighth cross-interrogatory he answers: That he has no recollection that he ever saw him; affirmant had other duties to perform which prevented him from looking into Winans' manipulations.

9. Was it a part of your duty, as President of the said Railroad Company, to examine the plans of construction of the cars intended for the use of said Company?

To the ninth cross-interrogatory he answers: That it was not his duty as President to do so.

10. Have you a sufficient acquaintance with the construction of railroad cars, as of the running gear and bodies, to designate differences of construction in various kinds of eight-wheel passenger cars?

To the tenth cross-interrogatory he answers that he has not.

11. Will you please state, if you remember, whether a certain Conduce Gatch was in the service of said Company and in what capacity?

To the eleventh cross-interrogatory he answers: That he has no recollection of said Conduce Gatch at all.

12. Do you remember ever to have seen a plan of construction of the running gear or body of an eight-wheel passenger car exhibited to you?

To the twelfth cross-interrogatory he answers: That he does not recollect to have seen a plan of the construction of the running gear and body of an eight-wheel passenger car exhibited to him.

13. Where did you see the Columbus? and who was the Manager or Superintendent of the building, (if any,) where it was exhibited?

To the thirteenth cross interrogatory he answers: That he saw the Columbus on the road, and rode in it.

(Signed,)

P. E. THOMAS.

## DEPOSITION OF GEORGE BROWN.

WINANS vs. SCHENECTADY AND TROY RAILROAD COMPANY.

### *Interrogatories by Plaintiff to George Brown.*

1. State whether you know the Plaintiff in this cause, and if yea, how long have you known him?

To the first interrogatory he answers: That he knows Ross Winans, the Plaintiff, and has known him from the year 1828.

2. Was the Plaintiff ever in the service of the Baltimore and Ohio Railroad Company, and, if yea, when, and in what capacity?

To the second interrogatory he answers: That he thinks the Plaintiff was in the employment of said Baltimore and Ohio Railroad Company, and to assist Mr. Knight in matters of machinery. Mr. Knight was Chief Engineer. He cannot fix the date; thinks it was in 1829 or 1830, on Winans' return from England.

3. Do you know anything in regard to the introduction of the eight-wheel car into use on the said railroad? and whether the said Plaintiff had anything to do therewith. State all that you recollect on the subject, and what opportunities you had of knowing any thing about it.

To the third interrogatory he answers: That with regard to the date, he cannot speak; but one thing he distinctly recollects, that he was the Treasurer of the Company about that time, and that Evan Thomas, Ross Winans and himself, were talking over machinery, and whether it was suggested by Deponent, by Mr. Winans or Mr. Thomas, he cannot say, but it was suggested by some one of them, how much safer an eight-wheel car would be for passengers over the four-wheel car, and Mr. Winans then went on to make a drawing of such an eight-wheel car as he supposed would answer the purpose.

4. Look at the drawing marked "Oliver Cromwell, No. 1," and say whether you ever saw it before, to the best of your recollection, and when, and whether it represents the car Columbus as you remember it.

To the fourth interrogatory he answers: That the drawing marked "Oliver Cromwell, No. 1," represents the car Columbus which witness superintended the building of, or saw building every day after Winans made the drawing. Deponent got the Board of Directors to have a car made after the drawing, as an experiment.

### *Cross-Interrogatories to George Brown, a witness sworn and examined on the part of the Plaintiff.*

1. What was the particular office which Winans held in the em-

ployment of the Railroad Company? and state if you have positive knowledge of his particular duties appertaining to the same.

To the first cross-interrogatory he answers: That when Mr. Winans first came, he brought a plan of friction wheels; but when he came into the Company's employment, or in what particular capacity, he cannot say. He was looked upon as inventing and improving machinery that was put on the road.

2. Do you mean to say that Mr. Winans was the inventor of any or all the machinery placed upon the road, and will you specify any invention of his that was placed upon said road?

To the second cross-interrogatory he answers: That Winans certainly was the inventor of machinery put on the road. He was employed to perfect the cars in their running gear.

3. Had he the exclusive control of any machinery put upon the road, to your positive knowledge?

To the third cross-interrogatory, he answers: That he does not know that Winans had the exclusive control of machinery put on the road. Deponent's impression is, that he suggested his improvements to Jonathan Knight.

4. Did you ever hear Mr. Winans claim to be the inventor of an eight-wheel passenger car of any description, and when the car Columbus was put on the road, have you any distinct recollection that the car was said to be the invention of Ross Winans? State particularly all you know.

To the fourth cross-interrogatory, he answers: That after the drawing was completed, Deponent never heard of any person mentioned as being the inventor of the eight-wheel car, except Mr. Winans, with the suggestions which Mr. Evan Thomas, Deponent, and Deponent's father, may have communicated to him in conversation. What Deponent communicated to him was this: that the eight-wheel car would be safer than the four-wheel car, and this led to their making a little drawing of the manner in which they supposed it could be arranged, in a rude way. The first suggestion to Deponent's mind, were two long beams of wood in which the wheels were to work singly—a plan which was not adopted.

5. Where and when had you seen an eight-wheel car which induced you to make any suggestions?

To the fifth cross-interrogatory he answers: That at that time, he had never seen an eight-wheel car in his life. The idea was suggested to Deponent by the circumstance that it would be safer, and that if a wheel broke, there would be less danger.

(Signed,)

G. BROWN.

#### DEPOSITION OF JOHN ELGAR.

WINANS vs. TROY AND SCHENECTADY RAILROAD COMPANY.

*Interrogatories to be propounded to John Elgar, a witness on the part of the Plaintiff in the above cause.*

1. Are you acquainted with the said Ross Winans, the Plaintiff in this cause, and how long have you known him? State whether he was



ever in the service of the Baltimore and Ohio Railroad Company, and if yea, in what capacity?

To the first interrogatory, he answers: That he is acquainted with the Plaintiff, Ross Winans, and first became acquainted with him in 1830, and understood that the said Winans in the summer of 1830, was in the employment of the Baltimore and Ohio Railroad Company, as Assistant Engineer of Machinery.

2. Are you acquainted with the eight-wheel passenger and burden cars in use on railroads? and if yea, when did you first see them in use, and under what circumstances? and what was your profession, occupation and employment at that time, and what now?

To the second interrogatory, he answers: That he is acquainted with the eight-wheel passenger and burden cars in use on railroads, and first saw an eight-wheel passenger car, he thinks, in 1831. It was a car called the Columbus, on the Baltimore and Ohio Railroad. He was employed on the said railroad at the time, as Assistant Engineer of Machinery, and his occupation now is that of a Civil Engineer.

3. To the best of your knowledge and belief, who was the first and original inventor of the eight-wheeled car, as a part of the machinery for the transportation of passengers and burdens upon said railroad? and if you name an individual in answer to this interrogatory, please to state all your knowledge and means of knowledge, grounds (facts) of belief, and attendant circumstances.

To the third interrogatory, he answers: That Ross Winans was the first and original inventor of the eight-wheel car now in use, as part of the machinery for the transportation of passengers and merchandise on railroads. Affirmant's employment was part of the time out at the Mount Clare Depot, superintending the construction of cars. And early in the spring of 1830, there was occasion to haul long timber on part of the railroad already laid, for the purpose of laying on embankments. To transport it on a railroad, it required to be loaded on two little platform cars of four wheels each, as on one car it would have swagged too much. To enable these four-wheel cars, one being placed under each end of the load, to pursue the curvatures in the road, they found it necessary to place a bolster on each of these cars, upon which the timber was loaded. These bolsters were suggested by affirmant, and put on the cars under his direction. And what first led to the suggestion of bolsters was, that the timber laid on the floor of each four-wheeled car restrained the cars from readily pursuing the curvatures of the road. These cars were afterwards coupled together with a piece of board, to transport timbers of shorter length—rail way timbers. These two four-wheel cars for hauling shorter timber, varying in length from twenty to forty feet, were coupled together with a long strip of board, by having a hole in each end, which dropped upon the draw-pin of the hindward and forward car. Having charge of the shops, affirmant was applied to by a Mr. Wentz, who had charge of hauling long ark(?) timber, to devise some mode of loading that timber, so that it should not occasion the cars to run off the track, which he found frequently occurring. Affirmant proposed at once to obviate the difficulty by the use of a bolster on the centre of each car. Wentz approved of the idea, and affirmant directed Conduce Gatch, who was chief carpenter at those shops, to have two bolsters made as soon as he could. This

was done in three or four hours probably, a load of timber put on them, and they answered the purpose intended, no more difficulty occurring. This occurred, he thinks, in the month of April, 1830; he knows it was in 1830, and he thinks in the month of April. At this time affirmant was very much engaged in procuring chilled wheels for the Company, and carried the idea of an eight-wheeled car no farther than this temporary contrivance. About the first of June following, Ross Winans returned from England and came to Baltimore, and, he believes, entered into the service of the Company, and was the chief of his time out at the depot of the Company at Mount Clare. Some short time after this, he, or some one, he cannot distinctly now recollect, showed affirmant a drawing, but he thinks it was a young man by the name of Cromwell, who was building or repairing the passenger cars. This drawing, to the best of his recollection, exhibited an eight-wheel passenger car, body and trucks together; and affirmant understood from general fame, that Ross Winans was the originator of this drawing; affirmant does not recollect that he had any particular conversation with Ross Winans on the subject then. Sometime in the year following, to the best of his recollection, a car which he thinks corresponded to the drawing, was put on the railway, and this car was called the Columbus; he thinks so. Affirmant rode in it once to Ellicott's Mills that summer, the summer of 1831. In 1832, affirmant left Baltimore and was engaged on the Columbia railroad, Pennsylvania, but was some time in Baltimore in that year, and in 1833 and in 1834, but not a resident; and during some of these years, perhaps during 1834, he noticed some other eight-wheel cars at the outer depot at Mt. Clare, one with the body suspended near the railroad track between the trucks, and he thinks it was called the Dromedary. About the time of the opening of the Washington branch road, the year he does not recollect, he noticed the present construction of cars used on that road, that is, he noticed that the cars put on that road were such as are now used, and he is aware that Ross Winans had the direction of the construction of those Washington cars.

4. Please to state what eight-wheel cars were made and used on the said railroad after the Columbus, up to the building of the Washington cars, and as far as you can recollect them. Please to describe the same, and wherein they varied from the car Columbus, and whether or not they were used on the said railroad, and whether their use continued, or whether they were abandoned? Look at the drawing marked "Oliver Cromwell," which is said to be a representation of the car Columbus.

To the fourth interrogatory he answers: That on recollection he thinks there was another eight-wheel car called the Winchester, composed of several common coach boxes set on a frame, at least it had that appearance; the car was constructed after that appearance. These are all the eight-wheel cars he recollects up to the opening of the Washington railroad. The coach boxes of the Winchester were on a level frame. The principal distinctive features in these three cars were between the two others and the Dromedary. The distinctive features were in the position of the running gear, and they consisted in placing the trucks in the Dromedary he thinks rather beyond each end of the body, so that the body swagged between them, whereas, in the other two, the trucks

were placed some small distance inward from each end. Not being a resident here, he could only give an impression, and this impression is, that said cars were not often used.

5. Now say whether you have read the specification of Plaintiff's patent, and if yea, state whether the car Columbus, supposing it to be truly represented on said drawing, corresponds with the car described in said specification, and if not, in what does the difference consist? and whether the said car Columbus fulfils the requisition of the said specification? and, if you say there are differences, please to state whether they are important?

To the fifth interrogatory he answers: That he has looked at the drawing marked "Oliver Cromwell, No. 1," and attached to the deposition of Oliver Cromwell, and has read the specification of the Plaintiff's patent. He does not consider the car Columbus, supposing it to be truly represented on said drawing, fulfils the requisition of said specification. He thinks the specification calls for the axles and wheels of each truck to be placed as near to each other as may be to work freely, and that each truck should be separated from the other under the body of the car as far apart as the strength of materials and convenience will admit; and on this drawing the wheels of each truck are farther apart than is called for in the specification, and the two trucks are placed nearer together, or farther from the ends of the body than is called for by the specification. He thinks the differences he has stated are important. He cannot say that the drawing now shown him is the one shown him by Oliver Cromwell, but said drawing is a fair representation of the eight-wheel car Columbus, as he now recollects it.

6. State whether the construction of an eight-wheel car involves a careful arrangement and adjustment of parts and proportions in reference to its use, or whether these are matters of comparative indifference.

To the sixth interrogatory he answers: That he thinks that a proper adjustment of the several parts is important, and if a careful adjustment is not attended to, injury will be suffered or benefits lost.

7. Please to state whether or not the specification of the Plaintiff's patent herewith shown, contains a full description of the principle and mode of operation of the eight-wheel cars now employed upon the railroads of the United States, so far as your knowledge of such employment extends, and contains all matters requisite for the construction and use thereof.

To the seventh interrogatory he answers that he thinks so.

8. Please to state whether, in your opinion, the occasional use for the transportation of long timber of two common dirt cars, with platforms and bolsters connected by a perch of length corresponding to the length of the timber, and used to prevent the cars from being drawn apart and from under the load, the motive power being attached to the body of the car and not to the timber, constituted an eight-wheel car such as is described in the specification aforesaid; and, if not, wherein is the difference to be found?

To the eighth interrogatory he answers: That he thinks it does not constitute an eight-wheel car as described in the specification aforesaid. The difference that strikes him is: that one is a combined permanent machine and the other a temporary vehicle. They differ again in this: that the axles and wheels of the platform car used as a truck in the



lumber car are placed farther apart than the specification calls for, because these platform cars are often used separately for common purposes. They would not answer so well for a single load as if placed as close together as the specification calls for; and they differ again in this: that in the lumber car the motive power was attached to the running gear, which may put a constraint on the free action of the running gear. In the other case, in the eight-wheel car, the motive power is attached to the body, and this leaves the trucks free to pursue the curvatures of the road.

WINANS vs. THE TROY AND SCHENECTADY RAILROAD COMPANY.

*Cross-Interrogatories to be propounded to John Elgar, a witness sworn on the part of the Plaintiff.*

X 1. In answer to the 1st interrogatory you say you understood that Mr. Winans was employed as an Assistant Engineer of Machinery in 1830, by the Baltimore and Ohio Railroad Company; can you say positively that he was so employed, and why you have that impression?

To the cross-interrogatories he answers:

To the first cross-interrogatory he answers: That he cannot state it positively, but he understood from Winans, that soon after his return, he was taken into the Company's employ within a month, or two or three months; he thinks he understood this from Winans. He cannot be positive about Winans being an Assistant Engineer at that time, but affirmant is positive that he was an Assistant Engineer in 1831. He heard Winans say so in 1831 or the spring of 1832, and he heard the Chief Engineer, Jonathan Knight, say that Mr. Winans was his Assistant Engineer of Machinery. Affirmant was at that time Assistant Engineer of Machinery, and when Winans first came there, he thinks Winans was assisting affirmant, and both of them assisting the Chief Engineer, and shortly before he went to Pennsylvania he heard Jonathan Knight say that Winans was principal Assistant Engineer of Machinery.

X 2. When did you first see the application of the bolster and swivel principle applied to the transportation of timber with eight-wheels?

To the 2d cross-interrogatory he answers: That he never saw the use of bolsters upon a railway till he suggested it to Gatch; he has seen it applied on common roads.

X 3. When you say that Ross Winans was the inventor of the eight-wheel car, do you mean the eight-wheel passenger car or all eight-wheel cars, for any and all purposes?

To the 3d cross-interrogatory as to what eight-wheel cars were the invention of Winans, he answers: That he means the eight-wheel passenger and burthen cars as they are now used.

X 4. Is there any similarity in the principle as applied to the transportation of timber, as contained in your instruction to Gatch, and that of the eight-wheel passenger car now in use? and if there is any difference, state in what it consists.

To the fourth interrogatory, he answers: That the only close similarity that he sees, is in the use of the bolster, which is used in both. The differences between them are such as he has stated in answer to the eighth interrogatory in chief.

X 5. In transportation of timber on eight-wheels, as you have de-



scribed, was the distance of the wheels apart a matter of observation and regulation dependant upon the length of the timber?

To the 5th cross-interrogatory he answers: That in the timber car the distance of the trucks apart depended on the length of the timber.

X 6. After you suggested the use of the bolster, did it ever occur to you that the same principle might be applied to passenger cars, and did you ever express that view?

To the 6th cross-interrogatory, he answers: That he has no recollection that the use of it, as applied to passenger cars, ever occurred to him, and he does not think it did occur to him.

X 7. At the time you made the suggestion to Conduce Gatch, to have the bolsters made for the transportation of timber, had you any suggestions made to you by Ross Winans?

To the 7th cross-interrogatory he answers: No. Ross Winans was not in the country at that time. It would be more proper for him to say that he had never seen Ross Winans at the time he made the suggestion to Gatch.

X 8. How often did you see the drawing which you say was shown you by Cromwell, of the car Columbus? and do you know that the running gear of the Columbus was built after that drawing?

To the 8th cross-interrogatory he answers: That he does not recollect to have looked at said drawing more than once; he may have done so. He does not know that the running gear of the Columbus was built after that drawing.

X 9. When did you first hear that Ross Winans claimed to be the inventor of the eight-wheel passenger car, or how did you obtain that impression?

To the 9th cross-interrogatory he answers: That to the best of his recollection, it was about the time the Columbus was built, that he first heard Ross Winans claim to be the inventor of the eight-wheel car; he does not recollect any particulars. It was only from a general impression, from his having this drawing made and the car built, that it was the general conversation about the shops that Winans was the inventor. His strong impression is, that Ross Winans did claim to be inventor of a combined machine, by placing a body on bolsters to carry passengers and merchandize.

X 10. Did he claim the eight-wheel car, as used with bolsters, as his?

To the 10th cross-interrogatory, he answers: That he only understood him to claim them as a combination in the combined machine, as a part of the combination of the combined machine.

X 11. When you say that the location of the wheels was at the ends of the timber, did you not know that the timber might be placed upon the wheels and transported with the wheels brought closer together?

To the 11th cross-interrogatory he answers: That he certainly might have known, if he had thought of it, that the wheels might have been varied in their distances; but he never thought of it.

X 12. Was not the advantage of placing the trucks near together, to prevent the swagging of the timber, thought of by you, as well as the action of the bolster to adapt to the wheels to the curves?

To the 12th cross-interrogatory, he answers: No, not thought of by him when he started the thing, that is, when the bolsters were put on

the cars. Affirmant went away on other business, and paid no further attention to it at that time, but the next day the wagoner reported to him that it answered the purpose completely.

X 13. Do you know whether, in the practical use of the bolster principle, the trucks were brought together by the workmen engaged in such transportation?

To the 13th cross-interrogatory he answers: That he does not know, except only in the case of hauling short timber, the trucks were brought proportionably nearer together.

X 14. Is there anything stated in the specification of the patent of Ross Winans, which you think important to produce the benefits claimed for his invention, and which he claims as new and important? was it not known to you before the reading of the specification, and also independent of the information you derived from seeing the car Columbus or any other car built under the direction, as you suppose, of Ross Winans? and if so, state what they are.

To the 14th cross-interrogatory he answers: That he thinks that although all the principles, separately, may have been known in theory to himself and others, that Winans claims in his specification, neither himself nor any other person, had ever combined them into a whole, so that they should mutually act to produce the benefits and advantages that do result from the car described in, and built from, the principles contained in his specification.

X 15. Do you mean, when you say that these principles were never combined together in eight-wheel passenger cars before Ross Winans' invention, that these combinations are mentioned by him as claimed, to be new? and do you believe that the combination expressly claimed by him is necessary to produce the results?

To the 15th cross-interrogatory he answers: That he understands Winans' claim, to be a claim of a new combination of principles of action, which may have been heretofore known. He does consider the combination described by the said Winans necessary to produce the full results claimed in his specification.

X 16. What do you understand to be the combination claimed as something new?

To the 16th cross-interrogatory he answers: That Winans combines the bolster principle with the trucks, and connects them with a permanent body; and he further combines the advantage of bringing the axles of each truck near together, which will not answer advantageously in a four-wheel car, and which had not been done before, and the extending the two trucks as far apart as strength of materials and convenience will permit; and he also combines with these that of attaching the motive power to the body, instead of the running gear.

X 17. If the weight is distributed properly in the eight-wheel passenger car, as is stated by Winans, was known to be important before his application, and was obtained by other eight-wheel passenger cars, is there anything else stated by him to be observed in his combination necessary to produce the results sought for?

To the 17th cross-interrogatory he answers: That besides the equal distribution of the weight, Winans claims the close proximity of the two axles in the two trucks, the wide separation of the two trucks, and the advantage of the motive power being hitched to the body, instead of the running gear.

(Signed,)

JOHN ELGAR.

The Defendant's counsel objected to the eighth direct interrogatory and Elgar's answer thereto, on the ground that the interrogatory and answer assumed without proof that he was an expert, but the Court overruled the objection, and the Defendant's counsel excepted.

## DEPOSITION OF JONATHAN KNIGHT.

IN THE CIRCUIT COURT OF THE UNITED STATES FOR THE NORTHERN DISTRICT  
OF NEW YORK.

ROSS WINANS vs. THE TROY AND SCHENECTADY RAILROAD COMPANY.

*June Term, 1850.*

JONATHAN KNIGHT, a resident of East Bethlehem township, in the County of Washington, in the State and Western District of Pennsylvania, being produced as a witness on behalf of the Plaintiff in this case, at the town of Washington, in said County, and examined *de bene esse*, by and before William K. Vankirk, a Judge of the Court of Common Pleas in and for said County, and being carefully cautioned and affirmed to tell the truth, the whole truth and nothing but the truth, deposeth, in answer to the interrogatories exhibited to him, on behalf of said Plaintiff, as follows:

*1st Int.* What is your name and profession, and how long have you been so engaged, and on what works of internal improvement have you been engaged as Engineer?

*Ans.* My name is Jonathan Knight. I am engaged in Agriculture in Washington County, Pennsylvania. I was Chief Engineer of the Baltimore and Ohio Railroad Company from the commencement of the year 1830 till the 31st of March 1842. My profession was then, and previously, Civil Engineering. In 1828 I visited England, in the service of said Company, to obtain railroad information, and returned to Baltimore in 1829.

*2d Int.* Do you know the Plaintiff in this suit? If yea, when and where did you become acquainted with him?

*Ans.* I am well acquainted with Ross Winans, the Plaintiff in this suit. I first met with him in Liverpool, England, about the first of the year 1829, whither he had gone in the matter of his friction car, and where I was then, as stated in my previous answer.

*3d Int.* Were you Chief Engineer of the Railroad constructed by the Baltimore and Ohio Railroad Company during the years 1831 to 1836, both inclusive?

*Ans.* I was Chief Engineer for the Baltimore and Ohio Railroad Company, as stated in my answer to the 1st interrogatory.

*4th Int.* Was the Plaintiff, during any portion of that time, in the service of the Baltimore and Ohio Railroad Company? If yea, state when, to the best of your knowledge, his engagement commenced, and what were his duties in the service of said Company.

*Ans.* The Plaintiff returned from England to Baltimore, Maryland, in the year 1830; and by authority from the Board of President and Directors of said Company, as Chief Engineer, I appointed said Ross Winans to be my assistant in the department of machinery of said Company. This appointment was made in the year 1831, and I believe took date from the first of that year.

*5th Int.* Do you know of the introduction on the Baltimore and Ohio Railroad, of the first eight-wheel car? If yea, state under whose direction and from whose plans it was constructed.

*Ans.* The first eight-wheel car was placed on the Baltimore and Ohio Railroad under my direction, in the year 1831 or 1832, according to my best recollection.

*6th Int.* State the name of the first eight-wheel car placed on said road, and the proportion of its parts in construction; that is, how near were the flanges of the wheels to each other on each side of each bearing carriage, and how near were the bearing trucks to each other in proportion to the whole length of the body of the car?

*Ans.* The first eight-wheel car was planned by Plaintiff, then my assistant, and I believe it was called the "Columbus." It was a passenger car. The body rested upon two cross beams or bolsters, each of which was supported by a carriage or truck, of four wheels and two axles. The wheels on the side of each truck were as close to each other as their flanges would well permit of. The car body being some 20 to 30 feet long, the bearing trucks were intended to be placed as far asunder as the length of the car would permit, consistent with strength. The trucks were under the ends of the car body.

*7th Int.* Were the proportions of this first car, adopted for subsequent cars, constructed for said road?

*8th Int.* How many and what other, by name eight-wheel cars, were constructed for said road prior to the building of the eight-wheel cars intended for the Washington branch of said road? Will you state the order in which these cars were constructed, and the variations made in each of them, as near as you know and as fully as you recollect?

*Ans. to 7th and 8th Ints.* This first car being imperfect, others were built by way of improvement, under the immediate direction of the Plaintiff, one of which cars was called the "Dromedary." These improvements were, in this manner, conducted and perfected in the fore part of the year 1834, when the eight-wheel passenger car, so invented and perfected by my said assistant, the Plaintiff, was fully adopted by the said Company, on my recommendation, and was accordingly constructed for use upon the Washington Railroad, to be opened in the next year, 1835.

I do not recollect the names of all the experimental eight-wheel cars, nor the precise changes or modifications of one from another, but which were all once known to me. According to my best recollection, they consisted in the relative external and internal forms and finish of the bodies and in the proper proportions for strength and a successful operation in practice of the principles involved in the eight-wheel car.

*9th Int.* Will you state in what particulars the "Washington Cars" varied in their proportions and arrangement of parts from the first eight-wheel car above referred to?

*Ans.* For answers to this I refer to my answer to the 7th and 8th interrogatories.

*10th Int.* Please state in detail whether the construction of an eight-wheel passenger car involves a careful arrangement and adjustment of parts and proportions with reference to its use, or whether these are matters of comparative indifference.



*Ans.* In the truck supporting each end of the eight-wheel car, the two axles may be placed as near to each other as is compatible with a free revolution of the two wheels on each side of said truck, so that the said two wheels shall not at any time come in contact with each other. Then the truck of four wheels will be so compact, or occupy so little of the road, lengthwise of the same, that the said truck will traverse the curves of the road almost with the like ease and freedom from resistance and wear, as would a single axle and its two wheels. Two such trucks being placed under a car body, in such a manner as to turn at a centre freely, will therefore traverse the road approximately as easy as only one of them; while the car itself may be of any convenient length, say to accommodate 40, 50 or 60, or even more passengers. The trucks must be placed so as to give stability and relative strength to the car body resting upon them; an arrangement that like all the others, had to be attained in the experiments already mentioned in my answers to preceding interrogatories.

*11th Int.* Has the eight-wheel car as at present used, any advantages over the four-wheel cars made for the same purpose of transporting passengers and merchandise? If yea, state these advantages.

*Ans.* The eight-wheel car thus perfected, and at present used generally upon railroads in the conveyance of passengers, has decided advantages over the car of four wheels, as being more capacious and pleasant, and easier warmed in winter, safer and subject to less wear and tear and fewer accidents. Hence its adoption has become general. In the year 1834, I had no hesitation in recommending its adoption by the Baltimore and Ohio Railroad Company for the conveyance of passengers, but it was not clear to me then, that the car of eight wheels similarly arranged, should be preferred for the freight business. Subsequently, however, the advantages of that sort of car have, I believe, proved such as generally to supersede the four-wheel car, except in the regular transit of coal.

*12th Int.* Have you read the specifications of the letters patent issued to the Plaintiff, Ross Winans, Oct. 1, 1834, for an improvement in the construction of cars intended for use on railroads? If yea, state whether or not the specification contains a full description of the principle and mode of operation of the eight-wheel car now used on the railroads of the United States, so far as your knowledge extends, and whether it contains all the suggestions requisite for the construction thereof.

*Ans.* I have read the specification of the letters patent, issued to Ross Winans, the Plaintiff, of Oct. 1, 1834, for an improvement in cars for railroads, and so far as my knowledge extends, I believe the specification contains a full description of the principle and mode of operation of the eight-wheel car now used on the railroads in the United States, and contains all the suggestions requisite for the construction of such cars.

J. KNIGHT.

## DEPOSITION OF JOHN H. B. LATROBE.

ROSS WINANS vs. THE TROY AND SCHENECTADY RAILROAD COMPANY.

*Interrogatories to John H. B. Latrobe, a witness on the part of the Plaintiff.*

1. Do you know the Plaintiff in this cause, and how long have you known him?

To the first interrogatory he answers: That he knows the Plaintiff in this cause, and has known him since his return from Europe, in 1830.

2. Did you know the car Columbus, spoken of by the witness in this cause, as having been used on the Baltimore and Ohio Railroad, and at what time?

To the second interrogatory he answers: That he recollects the car Columbus well, and rode in it in the summer of 1831.

3. Do you recollect the cars with eight wheels which were subsequently put on the said road up to the opening of the Washington road? and if yea, describe them to the best of your recollection.

To the third interrogatory he answers: That he recollects distinctly three cars of eight wheels, built after the Columbus, and put on the railroad in 1834. The first was named the "Winchester," which was composed of three carriage bodies, built with swelled sides after the fashion of common coaches, and resting on a framing which in its turn rested on two trucks, which, as near as witness recollects, were under the centre of the outer bodies. The next car was called the "Comet," and consisted of five small carriage bodies, the three inner ones being suspended between the trucks, and the two outer ones being immediately over the trucks. These bodies rested on a platform composed of two side pieces, plated with iron, and curved so as to permit the inner bodies to hang between; the trucks were composed of four wheels each, and the bolster, instead of resting upon an ordinary frame, rested upon strong springs that connected the axles as they rested upon the outside journals. The wheels of the trucks were brought as close together as they could be, leaving room for the lower bolster to rest on the springs between them. The trucks were under the centres of the outer bodies. This car was subsequently altered, but the date is not recollected by witness, so as to put all the bodies on the same line. Witness appends hereto a rough diagram marked "J. H. B. L., No. 1," to explain his testimony more fully as regards the form and construction of the cars above mentioned.

The last car was the "Dromedary," which witness believes to be represented on the drawing marked "J. H. B. L., No. 2," with the exception that the spaces over the trucks were closed up so as to make a sort of box or car-body. Deponent does not recollect when these cars were commenced; he speaks of the order only in which they appeared on the road; he believes they were all being built at the same time.

The next eight-wheel passenger cars which witness recollects, were the cars on the Washington Railroad. Witness was, at the time here spoken of the counsel of the Baltimore and Ohio Railroad Company, taking, in common with many others connected with said Company, a

deep interest in all that related to its practical operation; and having a turn for matters relating to machinery, he was led, therefore, to pay constant visits to the workshops of the Company, and added his own suggestions to those which every body around the Company was giving. He can say with truth that he watched the building of the bodies of the Winchester and Comet from the commencement of their framing, and believes that the suggestion of the five bodies of the Comet was in part his own. Witness makes this explanation to account for one of his profession having knowledge on such a subject, and being able to speak of it with confidence after such a lapse of time.

*Cross-interrogatories to be propounded to J. H. B. Latrobe, a witness on the part of the Plaintiff.*

X 1. Did you prepare the paper, a copy of which has been exhibited in this case, as the specification of Winans' patent?

To the first cross-interrogatory he answers: 'That said specification was originally prepared by Ross Winans, and submitted to the late Dr. Thomas P. Jones and witness to be perfected.

X 2. Do you consider the car Columbus, as shown by the drawing now exhibited to you, as a sufficient representation of all that is important in principle in the specification of Winans' patent?

To the second cross-interrogatory he answers: Very far from it.

X 3. Have you any knowledge, derived from your connection with the Baltimore and Ohio Railroad Company, to state why it was that, after the Columbus was built and used, the same plan was not afterwards adopted, and why the varieties of cars named by you were made as experiments?

To the third cross-interrogatory he answers: That the car Columbus, while it succeeded in certain or some respects, was looked upon, as witness believes, as not sufficiently satisfactory to authorize adopting it as a precedent. It was used as an excursion car to Ellicott Mills principally, and was, although at what periods witness cannot say, altered. Prior to the opening of the Washington road, the character of the car to be adopted for use thereon, became a matter of importance and frequent discussion among those interested in the operations of the Railroad Company, and witness believes that the three cars mentioned by him in his examination in chief, were built with a view to the perfection of the eight-wheel car by experimenting upon different modifications of it. Witness would here state that the interest which he took in the subject of cars, was so well understood, that he was called on one occasion before the Board of Directors to meet Mr. Winans, and to discuss a point connected with the construction of the Washington cars, and on which Mr. Winans and himself had differed in opinion.

X 4. When you rode in the car Columbus on her experimental trip in 1831, was Ross Winans one of the party?

To the fourth cross-interrogatory he answers: That it is utterly impossible for him to mention one individual in the company; whatever might be his inference, his memory does not enable him to speak positively.

X 5. Did you hear at that time Ross Winans claim to be the in-

ventor of the car Columbus, or did you, from any knowledge you then possessed, ascribe to him the car Columbus as his invention?

To the fifth cross-interrogatory he answers: That from the commencement of his knowledge of the eight-wheel car, he has believed Ross Winans to be the inventor, as well of the car Columbus as of the car described in the specification of his patent; and this is founded as well upon the declaration of said Winans as upon the understanding of all the parties with whom witness associated in his relations with the Railroad Company, and whom he heard speak on the subject.

X 6. You will please answer the last interrogatory, as to the knowledge you then possessed. Did you, at that time, ascribe to him the invention?

To the sixth cross-interrogatory he answers: That he recollects distinctly having seen the car Columbus on her first trip, and having then looked upon it as the invention of Ross Winans.

X 7. Did you hear from him at that time that he claimed it to be his invention, and when do you recollect the first conversation on the subject?

To the seventh cross-interrogatory he answers: That he cannot, at this time, identify a single conversation which he had with Ross Winans by a reference to time, place or circumstances, up to the preparation of the specification of his patent, although he has no doubt that such conversations were of frequent occurrence. Deponent has no doubt that he heard from Winans that he claimed it; the Deponent cannot identify the time, place or circumstance. Deponent saw him constantly. Deponent, reviewing what has just been written, does recall an occasion, the date of which he fixes by the burning of the Athenæum, when Ross Winans showed him a drawing of the Washington car as subsequently built or then being built, (Deponent cannot say which,) and spoke of it as his invention. This was in the office of Deponent, in the Mechanics' Bank building, to which Deponent moved temporarily when his office in the Athenæum was burnt. The Athenæum was burnt on the 7th day of February, 1835.

Deponent desires to state that the room in the Mechanics' Bank occupied by him as an office, was, before he went into it, on the burning of the Athenæum, occupied by the Baltimore and Ohio Railroad Company, and it is possible that the interview with Mr. Winans, of which he speaks, may have taken place while it was so occupied. He is in doubt as to this fact, being positive only as to the fact of the conversation, the drawing which was shown to him, and the place where the conversation took place. This is the only conversation which he can particularly identify, as having been held with Mr. Winans, in reference to the invention of the eight-wheel car, *except* those connected with the preparation of his specification.

X 8. What was the period of time which elapsed after the building of the Columbus, and the preparation of Winans' specification?

To the eighth cross-interrogatory he answers: That all he can say in answer to this question is, that the preparation of the specification occupied much time, and he was consulted about it a long time before the patent was taken out, but how long he cannot say; whether six months or a year he cannot say. He only remembers that the specification was a long time on hand.

X 9. When you were consulted about the specification of Winans'



patent, had you any knowledge of the drawing exhibited in this case, marked Oliver Cromwell, No. 1?

To the ninth cross-interrogatory he answers: That he had no knowledge of said drawing, and knew nothing of it until it was produced by Oliver Cromwell, on the trial of the case of "*Winans vs. the Newcastle and Frenchtown Railroad Company*."

X 10. Did you not frequently see Mr. Winans on other subjects except the matter of the specification, in your capacity of counsel for the Railroad Company as well as his private counsel?

To the tenth cross-interrogatory he answers: That his intercourse with Winans, from the beginning of his acquaintance with him, has been frequent upon various subjects, professional and other.

(Signed,)

JOHN H. B. LATROBE.

### DEPOSITION OF BENJAMIN H. LATROBE.

WINANS vs. TROY AND SCHENECTADY RAILROAD COMPANY.

*Interrogatories to Benjamin H. Latrobe, a witness on the part of the Plaintiff.*

1. Do you know the Plaintiff in this cause, and how long have you known him?

To the first interrogatory he answers: That he knows the Plaintiff, and has known him since 1830.

2. Look at the drawing now shown you marked "J. H. B. L., No. 1," and say, if you know, who made it, when it was made, and what it represents? If you say you made it, state what was your occupation at the time, and what is your present employment. State the minimum curves on the Baltimore and Ohio Railroad, if you know the same.

To the second interrogatory he answers: That he has looked at the drawing marked B. H. L., No. 1, annexed to this deposition. Witness made this drawing in 1831, and it represents a car for the transportation of flour on the Baltimore and Ohio Railroad. There were other four-wheel cars on said road having different kinds of journal boxes, but resembling the car shown on said drawing in other particulars; and with the said variation in the form of the journal boxes, it was the ordinary form of the car in use on said road at that time for the transportation of flour and other commodities. At the time he made said drawing he was an Assistant Engineer in the employment of the said Railroad Company, chiefly employed in occupations connected with the location of the road. His present employment is that of Chief Engineer of the said Baltimore and Ohio Railroad Company. The minimum curves on said road were four hundred feet radius, which occurred frequently.

(Signed,)

B. H. LATROBE.

### DEPOSITION OF JOHN H. ALEXANDER.

WINANS vs. THE TROY AND SCHENECTADY RAILROAD COMPANY.

The deposition of John H. Alexander, a witness on the part of Plaintiff, taken 11th Oct. 1849, before John Carrere, a Commissioner, ap-

pointed by the Circuit Court, was then read in evidence, and which is as follows :

JOHN H. ALEXANDER being sworn, says that he is a Civil Engineer by profession, and is thirty-six years of age ; that in 1831 and 1832 he was an Assistant Engineer in the service of the Baltimore and Susquehannah Railroad Company, of which, in 1832, he was the Resident Engineer ; that, in July of that year, the locomotive called the Herald was imported from England for the use of the road. It had two driving wheels from which the power was connected with the forward wheels, all the wheels being of the same size, and, as he recollects, either four and a half or five feet in diameter, or thereabout. When it was placed on the road in August or September of the same year, it was found that it would not pass the curves, which were numerous, without a tendency to run off the track. On communicating this fact to George W. Whistler, the Engineer in charge, he desired Deponent to consult with and take the advice of Ross Winans in regard to such changes as were requisite to fit the engine for use on the road. Witness accordingly called on the said Winans, as he well recollects, and the whole subject was fully discussed between them. This was in the afternoon, and, on the following morning, Mr. Winans called on Deponent with a sketch exhibiting the substitution of a four-wheeled truck with wheels of thirty inches as near as he recollects, in place of the forward wheels of the engine. The truck was subsequently constructed, placed under the engine, and was found to answer the purpose. Witness with his own hands draws here a sketch, which he believes to represent accurately the original sketch furnished by said Winans. Witness is able to do this, because within eighteen months he found the said original sketch among his papers and recognized it at once, which said sketch is either lost or mislaid, so that he cannot put his hands thereon.

This sketch, rough as it appears, conveyed to Deponent's mind the idea of the truck in place of the forward wheels of the engine, and the truck was subsequently constructed from it, as before stated.

(Signed,)

JNO. H. ALEXANDER.

11th October, 1849.

#### DEPOSITION OF OLIVER CROMWELL.

The Plaintiff's counsel then called as a witness on the stand, OLIVER CROMWELL, who testified as follows : I reside in Baltimore ; am a coach-maker ; have worked at that business since 1824. I have worked on railroad car bodies in the employ of the Baltimore and Ohio Railroad Company, and of other companies ; commenced working for the Baltimore and Ohio Railroad Company in 1830 as a journeyman ; Conduce Gatch was foreman of the shop ; I have known Plaintiff since 1830. When I first knew him, he was engaged about the depot giving directions respecting the work,—about the cars principally. The part of the railroad which was first opened, was from Baltimore to Ellicott's Mills, about fifteen miles ; that was before I came there to work. Ellicott's Mills are about five or six miles west of the Washington branch. The Washington branch road was opened in 1835.

In 1831, I first had knowledge of an eight-wheel car. The first information I had of it was from George Brown, who said Winans was getting up a drawing; this was early in the spring of 1831. There was a drawing brought out. (A drawing being shown to the witness, he says): that is the drawing which Winans brought to me to work from. I have not the slightest doubt it is the same—the drawing represents the body and running gear. I think it was in March, 1831. I had not before seen or heard of an eight-wheel car. I immediately commenced working on the body at the Mount Clare depot, where the Company had a shop. I worked about three months on that body. Mr. Conduce Gatch had charge of the shops at the depot. He was foreman of the shops. There were two wood workshops and one blacksmith shop; the shops were three or four feet apart near the track of the railroad. The trucks were made in the shop adjoining that in which I worked. The trucks were made sometime while the body was making; it took longer to make the body than the trucks.

Rupp and Michael Glenn were the men employed in building the trucks in Gatch's shop. Francis Gatch worked next me on the car body. Winans was about there and occasionally gave directions about making the body. I think he took his idea of the running gear from this drawing. The drawing was in the shop where I was working, and Gatch would naturally look at it; he was often in the shop.

Gatch was foreman of all the shops, the wood work and blacksmith shops. I know of his taking the dimensions of the running gear from the drawing. He had a drawing board in his shop, and my impression is, he made the draft on his board from the drawing, and went to work and made the trucks. The scale of the drawing was three quarters of an inch to the foot. [The drawing was marked Oliver Cromwell, No. 1.] This drawing became soiled by being nailed over a stove hole two or three years after I left the employ of the Company. I left the Company in 1832. I had the drawing in my possession for seven years. I put it up over the stove hole.

That car (the Columbus) was first put upon the road in 1831. There was a disposition to have it on the road before the 4th of July. It made an excursion on that day with other cars to Ellicott's Mills. I saw the Columbus move from the depot; she had a few days before made a trial trip to the Relay House, about nine miles. The running gear of the Columbus was built pretty much as represented in the drawing. It had friction boxes like the model shown to me.

[The Plaintiff's counsel then offered to ask the witness in what manner the car was attached to the motive power (or) to the following car in the train, to which Defendant's counsel objected, on the ground that the manner of attachment was not described in the specification. The Court overruled the objection, and admitted the evidence, to which the Defendant's counsel excepted.] The witness says the connection between the Columbus and the motive power was by a perch from the truck, as exhibited in the drawing marked O. Cromwell, No. 1. The Columbus occasionally run off the track in turning curves. Some alterations were made in it shortly after it was built; a new bolster was put on, and I think the wheels of the trucks were drawn nearer together. I cannot state how long the friction boxes were used. I think but a short time;

different forms of friction boxes were used. I left the employ of the Baltimore and Ohio Company in October, 1831; returned in June, 1832; then continued until October, 1834.

The next eight-wheel car built was the Winchester. She was put on the road in 1833. The Columbus did not appear to give satisfaction. No cars gave satisfaction until the Washington cars were built. The Winchester had three separate bodies placed on a frame. My impression is, that she was connected to the motive power by the frame on which the bodies rested. The Winchester was used generally and was considered a pretty good car. I cannot state at what season of the year she was put on the road; it was some considerable time before the fall of 1834, when the plan of the Washington cars was adopted.

The Dromedary was the next car built; it was suspended at the ends, having four apartments in one frame. In the Winchester, the three bodies were separate. The Dromedary was put on the road in 1834, before I left in October, but did not answer a good purpose. My impression is, she was connected to the motive power by the trucks. I do not recollect of any other car being built while I was there; my recollection is not distinct about the Comet; I was not in the employ of the Company when the Washington cars were built. I have seen them on the road; they had long bodies, the entrance at the ends with a platform, connected to the motive power from the body of the car; they had two trucks under them; there was an under framework on which the bodies rested. The bolsters were of iron, and I think they had a spring over each journal. These cars, I understood, were planned by Winans.

Oliver Cromwell, on *cross-examination*, testified as follows: I saw Conduce Gatch take a measurement from the drawing which I have spoken of. I saw him measure the drawing of the trucks to make a truck by. There was no scale shown on the drawing. I was told by Mr. Winans what the scale was.

The measuring of the drawing would give the length of the truck. I think Mr. Winans gave instructions about these drawings, besides what is contained in that drawing marked Oliver Cromwell, No. 1. I cannot say positively that Mr. Winans gave any instructions as to the construction of the trucks; if he did, it was to Mr. Gatch. I don't know that I heard him give any instructions to Mr. Gatch; cannot say whether I did hear him give any instructions or not to Gatch.

I feel perfectly confident the trucks were not completed before I began the body. I commenced working for the Company the latter part of May, 1830; the Plaintiff was not there at that time; Francis Gatch was the only person who worked in the shop with me; Conduce Gatch had the superintendence of all the shops; Winans' employment was outside about the depot and in the shops; he was out there about every day; his office was located at the Company's office in Baltimore, about three quarters of a mile from the shops; Mr. Elgar was about there; he and Mr. Gatch had consultations about the construction of those cars; I don't know that I *heard* Mr. Winans claim the invention of the running gear on the body of the Columbus. Before I began to work on the Columbus, I saw two burthen cars used on the railroad for drawing timber. Bolsters were placed on the platform. I have seen drafts of various trucks on the draft board of Conduce Gatch before and after the



Columbus was built. I first saw the Washington cars when they were building, and I saw them when they were put on the road. Those cars had a frame work resting on the trucks, and the body rested on the frame work, which raised the bodies eighteen or twenty inches above the bolsters; the springs were under the frame.

On *re-examination*, the witness testified as follows: I did not hear any person except Mr. Winans claim the invention. I think the drawing of the Columbus was sufficient to enable a mechanic to construct a truck from. I cannot say whether the drawings of trucks on Gatch's draft board, which I saw before the Columbus was made, were like the trucks of the Columbus or not. I don't know that before I saw the drawings of the Columbus I had seen the drawings of any trucks adapted to a double truck eight-wheel car. The cars built before the Columbus were the common four-wheel cars.

The said Oliver Cromwell, on being again cross-examined, testified as follows: I never worked by a scale before making the car body of the Columbus; coach makers, as a general practice, work from a draft of full size; I was a coach body maker; I never worked on wheels. The flanges on the wheels of the Columbus were on the inside of the rails; I never saw any outside.

#### DEPOSITION OF MICHAEL M. GLENN.

MICHAEL M. GLENN was called as a witness by the Plaintiff, and testified as follows:

I reside on the eastern shore of Maryland; I was formerly a carpenter; was in the employ of the Baltimore and Ohio Railroad Company from 1829 or 1830 to 1840 or 1841. I was engaged in the shop, doing anything that came along; this was a new thing then; this was the first road I ever heard of in this country. I know Conduce Gatch and Ross Winans; became acquainted with Winans in 1830 or 1831; it was directly after his return from Europe. He was about the shop there engaged on the machinery. He was Civil Engineer under Jonathan Knight. The shop Gatch and I worked in was at the Mount Clare depot; the shop Cromwell worked in was two feet from it; there was an entrance from the one to the other; Gatch's business was to oversee all the shops as foreman, and to see that the men did their work; he worked as the men did. In 1830 or 1831, I first saw a drawing of an eight-wheel car; it was brought to the shop, I believe, by Winans and laid on Cromwell's table. It is the one shown to me, (marked Cromwell No.1); I first saw it on Cromwell's bench; I don't remember having it previously spoken of; the body of Columbus was built in Cromwell's shop. I assisted in building the trucks of Columbus in the shop adjoining Cromwell's. I think the trucks were built while the body was being built, from the drawing. Jacob Rupp and I were the workmen. We considered they were built under Winans' direction. He was about the shop and the depot nearly every day. The trucks were built in the form shown in the drawing; the trucks were connected to the motive power by a perch; the perch was attached to the cross pieces of the truck; there were no springs; friction boxes were used, which gave ease to the motion of the car. The work on the Columbus

commenced in March or April, 1831, and she was brought out in June or July. We did not like the Columbus. I think the difficulty was, she would not traverse the curves as well as they desired. The Columbus was twenty-seven feet long; the cars in use vary a good deal in length. I never knew an eight-wheel car built before the Columbus, after that plan; I had never met with any such truck before that or knew of any. I think I received directions from the Plaintiff while working on the trucks; it was his plan of construction; there was some alterations made in the Columbus, but I forget what. The next eight-wheel car constructed then was the Winchester; I can't recollect when she was constructed; I don't remember how she differed from the Columbus, except that she was hauled by the body and that she had plain boxes. Another car was built called the Dromedary; I don't remember the time; she differed in shape from the others; she was connected to the motive power by the running gear; they did not like her. I think she was connected to the motive power by a perch, like the perch in the Columbus; I don't know what the difficulty with her was. The Comet was built last; I don't know when she was brought out. I think the road adopted Winans' cars in 1834. I was then Superintendent on the road. I cannot say how long this was after the Comet was brought out. I think they did not like any of the four cars before named; they did not work well. I saw the Washington cars when they came on the road; there were at first two, three or four of them; it was 1835; the building of them commenced in 1834; the body of the car was fixed on two bolsters to each truck, one on the top of the other; there was a spring to each box; there was a king-bolt went through each two bolsters; the trucks were free to play; there was a spring playing in sockets in the top of each end of each upper bolster, to give ease to the car; the bolsters were of wrought iron; there has been no material change made in the cars since; this arrangement of the trucks is useful; all the Railroads use this description of cars.

The witness being *cross-examined*, testified as follows:

The first time I saw the drawing, it lay on Cromwell's bench. I did not see it brought there; the Plaintiff gave the directions in relation to making of the trucks; he explained the way they should be made. He explained something about the bolsters; it was an unusual thing to us to fix the bolsters in the way those were fixed. He showed us how to fix the friction boxes; the Columbus was drawn by horses. I don't know by what power the Winchester or Dromedary was drawn, nor the Comet. I don't remember whether any other car was attached to the Columbus when she run to Ellicott's Mills, on the 4th of July, 1831; I had never before saw bolsters fastened on trucks. I have seen two four-wheeled platform burden cars, used for drawing long sticks of timber, a bolster on each end of the platform cars. I saw it before the Columbus was built. I did not have the drawing before me when we worked at the trucks of the Columbus. Conduce Gatch gave us directions, but not more than the Plaintiff. Mr. Gatch directed us to go on and make the trucks. We worked from the drawings on a board. I think Mr. Gatch made that drawing. I am acquainted with operations of railroads. I was Superintendent of the cars of this road under George Gillingham for nine years. I think Winans saw the drawing on Gatch's board; I have no doubt he saw it. I think but one of the four

cars before named was drawn by the body. I think that was the Winchester. My business as Superintendent of the cars was to see that the cars were kept in order. The Washington cars were stronger built and simpler, and considered safer than the Comet, because the running gear had free access to the rail and was less liable to run off, not having any perch to bind them, and vibrating with the curves of the road. I forget whether the Comet had a perch or not. I am not able to say whether I worked on the Comet. I did not on the Washington cars.

On *re-examination* the witness said :

I think Gatch got his drawing on his draft board from the drawing which Cromwell had; I think I saw him bring the drawing into the shop; I was at work on the bench near him within two feet, and saw him draw it, I think, on the bench. What I mean by adopting the cars is, that they were used on the road. Some ten or fourteen cars were made for the Washington road before I left. The last cars made for that road before I left, were constructed in the same manner as the first Washington cars were. I left in 1840 or 1841; locomotive power was brought on the road before I left; no other power was ever used on the Washington branch.

#### DEPOSITION OF WASHINGTON O. FROST.

WASHINGTON O. FROST, a witness called by the Plaintiff, testified as follows :

I reside in the State of Maine; I resided in Baltimore from boyhood until 1833; I was in the employment of the Baltimore and Ohio Railroad Company; I worked for them in 1829; I was an apprentice to Conduce Gatch, to learn the trade of a millwright; I left the employ of the Road in June, 1833; I became acquainted with Plaintiff in 1829; I never saw an eight-wheel car until 1830 or 1831, when I saw the Columbus; I think another was built in 1832, after the Columbus had made one or two trips; the body of the Columbus was commenced before the running gear. Oliver Cromwell and Francis Gatch worked on the body; the running gear was built in an adjoining shop; one of the trucks was made by Glenn and Rupp; I think I worked on the other truck some; Mr. Conduce Gatch worked some; I saw a drawing of the car; it was furnished by Plaintiff; Mr. Gatch had a drawing of the truck on a board in the shop where I worked; it was not a full drawing, but a sketch; he took it from the drawing of Mr. Winans.

On his *cross-examination* the witness testified as follows :

I saw Plaintiff bring out a drawing; I think he gave it to Mr. Gatch; am certain he did; I have seen the drawing here to-day; had not seen it before since I saw it in the shop; I know it to be the same because it was painted yellow, and from the form of the trucks; I think it was the latter part of 1830, or the fore part of 1831, that Plaintiff brought out the drawing; I was in my 22d year; I think I saw Winans about the shops in 1829; I examined the drawing when Winans brought it out; I think other eight-wheel cars besides the Columbus had been put on the road before I left in 1833; I went from Baltimore to Boston, where I was employed by the Boston and Providence Railroad Company in making cars; I now reside in Hallowell, Maine.



## DEPOSITION OF ANDREW S. POND.

ANDREW S. POND, a witness called by the Plaintiff, testified as follows: I reside in Utica, and am in the machinery and foundry business; have been in that business 41 years; have made steam engines and other machinery of various kinds; have made some parts of work for cars for Eaton & Gilbert, coach makers in Troy, and afterwards I saw some of the articles which I furnished to them on cars on the Schenectady and Troy Railroad. I furnished some bumper irons with spiral springs. Eaton & Gilbert are extensive builders of railroad cars. I think I first saw eight-wheel cars on Defendant's road in 1842. I first went over the road in 1842; they then had the eight-wheel cars; have been on this road I think a dozen times; eight-wheel cars are used on the road. I never saw any but eight-wheel cars on the road; I think the passenger cars will carry forty-eight or fifty passengers; they had two trucks, one under each end or near each end, a spring to each wheel, draught from body of car; under the body of car the trucks are pivoted. I should think the wheels of each truck almost  $3\frac{1}{2}$  feet from axle to axle; wheels about thirty inches in diameter; there was room for a brake between the wheels; the cars are like those on other roads in this State and other States. I have travelled extensively on railroads. The cars in Massachusetts, Connecticut, Rhode Island, New Jersey, Pennsylvania, Maryland and to Washington, are similar cars; this truck movement to turn around curves is found in all these cars and in those on Defendant's road. I have read the Plaintiff's specification and seen the drawings. I think I could make a car from them without difficulty. The cars of Defendant's road differ some from the Plaintiff's specification; the bumpers are different. The first eight-wheel car which I ever saw was on the Auburn and Syracuse Railroad, in 1838. It had lattice frame work on the sides of the body, and trucks under; it is still used. I think the long cars were used on Defendant's road before they were on the Utica and Schenectady road. I have not seen four-wheel cars on railroads for a long time.

Being *cross-examined*, the witness testified as follows: I examined Defendant's cars; they had side bearings; they had bolsters fastened to the body and the trucks. I have seen nothing in the specification about side bearings, nor about the manner of attaching the cars to the motive power. The Defendant's cars are attached to the motive power by a cast-iron head, screwed into the centre of the front beam of the car, and they are attached to each other in trains by a link or two links. I find nothing in the Plaintiff's specification respecting the manner of attaching cars together to run in trains. I should think the distance in Defendant's cars of the centre of the trucks from the end, is about one-fourth the entire length of the car, including the platforms. The Plaintiff's specification does not mention the distance at which the trucks should be placed from the end of the car.

The Plaintiff then offered to ask the witness whether the drawing introduced by the Plaintiff shewed any arrangement that performed the office of side bearings. The Defendant's counsel objected that if the drawings represented any thing not mentioned in the specification, such addition could not be claimed as part of Plaintiff's invention.



*The Judge decided that the drawing might be referred to, to illustrate the specification, but not to enlarge the claim of the patent, and allowed the Plaintiff's counsel to examine the witness respecting what was represented in the drawing in relation to side bearings, to which the Plaintiff's counsel excepted.*

The witness Pond further testified :

In the side view of the drawing, the top and bottom bolsters lie so that any rocking motion would cause them to come together. I think on examining the drawings, that there would be a bearing but not a full bearing between the upper and lower bolster, in the rocking of the cars. I find in the end view of the drawing, a representation that the body and not the truck is to be coupled to the next car.

On being afterwards *cross-examined*, the said Pond testified as follows :

There would be a bearing of a little more than sixteen inches each side of the king-bolt. The upper surfaces of the lower bolsters are not raised at the ends in the drawing.

Question by the Court :

After all your examination, do you still find in the drawing a mode of preventing the excessive rocking of the cars?

*Answer.* I do.

The Plaintiff then rested.

The Defendants then gave the following testimony :

#### DEPOSITION OF SAMUEL WOOD.

SAMUEL WOOD, called by the Defendants, testified as follows :

I reside in Watervilet ; am in the employ of Defendants as a carpenter and joiner, and have been so a little over two years ; I am acquainted with the cars on Defendants' railroad. In the year 1847 there were four passenger cars and twenty freight cars ; they are all there now ; all of them have side bearings, some wheels and some slides ; I have measured the cars ; the freight cars are twenty-eight feet long ; the average distance between the king-bolts is nineteen feet five inches ; this distance varies in different cars ; the distance between the tread of the wheels in some of the cars is fifteen inches, in others twenty-one inches ; the bodies of the passenger cars are thirty-two feet long ; the distance between the king-bolts is twenty-four feet ; the distance between the tread of the wheels is fifteen inches ; the diameter of the wheels in all the cars is thirty-three inches ; in the locomotives the distance between the tread of the wheels in some is but three inches, in others a foot.

On his *cross-examination*, the witness testified as follows :

The motive power is applied to the body of the cars ; the trucks have free play under the bodies.

The Defendants then gave in evidence a patent to Ephraim Morris, dated 13th October, 1829, for a new and useful improvement for raising and lowering boats from one level to another on canals, the specification of which is as follows : (See Exhibit, No. 2.)

## DEPOSITION OF EPHRAIM MORRIS.

EPHRAIM MORRIS, called as a witness for the Defendants, testified as follows :

The drawing now shown, [and which is to be produced on the argument,] represents my car; the elevation of the lock plane was one to twelve; the summit plane one to ten; part of it one to twelve; the elevation from top to bottom was one to forty-eight. The road over which my cars run had no lateral curves, but only vertical. At the lock plane the chain was hitched to the body of the car; at the other planes the car was moved by a force applied to the body of the car; the swivel moved to accommodate the passing of the wheels over the vertical curves; there were iron rails like those of common railroads; the first railroad was a flat rail, the next an edge rail; the eight wheels divided the weight and prevented crushing the rail; the object of the swiveling was to enable the wheels to pass on to another inclined plane having a different inclination; the length of my car was fifty feet; the centre of the trucks was twelve feet from the end of the car; on some of the planes the wheels were three feet in diameter, others four feet; the tread of the four feet wheels were nine inches apart; the tread of the smaller sized wheels were further apart; I believe two feet three inches. The Plaintiff's trucks are the same as mine, except that the frame of mine had two beams, one each side of the wheels, the Plaintiff's had but one. In applying for my patent I did not think I had a right to claim the bolsters, because it was old and in common use. I had no idea of turning lateral curves with my car. My occupation is building and superintending the putting up of different kinds of machinery; I have always been engaged in that business; begun in 1827; am a practical mechanic; have been engaged in putting down turn tables; assisted in putting up the machinery at Harlem High Bridge; have superintended the putting up of steam engines and other machines.

In order to make my cars traverse lateral curves, it would only be necessary to put a piece of iron under the bolster, take out the four horizontal bolts and drill a hole through the bolster and insert a king bolt on the principle of a bolster of the fore-wheels of a common wagon, except the cars have side bearings; the necessity of side bearings depends upon the size of the centre bearings.

On being shown the drawings introduced by Plaintiff of his specification, the witness says :

No side bearings are represented in Plaintiff's drawing, except on each side of the king bolt; the upper and under bolsters appear to touch for the space of about sixteen inches each side of the king bolt.

The witness being *cross-examined*, testified as follows :

My trucks are bolted to the body of the carriage; they have no play except in a vertical direction; there is no mention in my patent of connecting those trucks with the carriage by two bolsters and a king bolt; there is no means described in my patent for swivelling in a lateral direction; I do not in my specification describe my car as a railroad car; I do not think that there is any more need of providing for variation from a straight line on railroads, than for variations from a horizontal plane; I saw eight-wheel cars used on railroads before my patent

expired; I never made any claim for remuneration from the railroad companies; I don't recollect whether I first saw a railroad before or after I took out my patent; it was about that time I first saw a railroad at Hoboken; it was about sixty yards long; the track was two feet wide; I never saw a railroad car with four bearings for each axle; Winans' truck has a play for the lower bolster, mine has not; I should not as an Engineer, construct a railroad axle with four bearings.

## DEPOSITION OF CONDUCE GATCH.

*(Referred to in the Deposition of John Carrere, Esq., page 374.)*

CIRCUIT COURT OF THE UNITED STATES, NORTHERN DISTRICT OF NEW YORK.

ROSS WINANS, vs. SCHENECTADY AND TROY RAILROAD COMPANY.

CONDUCE GATCH, for Defendant, deposes and says as follows:

I am fifty years of age; I reside in the city of Baltimore, and have been in the employment of the Baltimore and Ohio Railroad Company. I think it was early in 1831 that I went into the employment of said Company, and I think I left them in May or June, 1834, the employment of said Company. I was employed to superintend the building of cars, and making patterns. I am a millwright by trade. After the Baltimore and Ohio Railroad had progressed as far as Ellicotts' Mills, we found great difficulty in carrying long timber for the purpose of constructing the road, and sometimes in loading hogsheads of sugar and other articles they rolled to the end of the car and tilted the end down; the wheels were set from four to five feet apart at that time, on four-wheel cars from the centres of the axles, and from this difficulty the idea of an eight-wheel car was first suggested to my mind. In order to obviate then the difficulty, I had a plate of iron placed on a truck or stone car, exactly in the centre, and on that I placed a bolster with a corresponding plate of iron on the under side of the bolster; an iron pin passed through the bolster to hold the bolster to its place. I placed two of these cars, with bolsters corresponding, at any suitable distance to carry lumber; which lumber was from twenty-five to thirty feet long; the axles were about two feet ten inches apart. This was the first construction. There were two principal objects in view: one was, to remove the difficulty in loading long lumber on a short car, and the other was, that we found that wheels placed four or five feet apart, passed through the switches and curves a great deal harder than when the wheels were placed close together; there was more friction and consequently more jarring, and it was harder on the car. I do not know that we used after this invention any cars with the wheels four or five feet apart, that is any eight-wheel cars where two trucks were used. The wheels after this invention were placed as close together as they could conveniently be. The only principle involved in my invention, was the enabling of the truck or the frame work and the four-wheels to pass round under the load at any angle almost, and to adapt itself to the curve; one truck could be turned at right angles with the other, each truck being placed at any distance apart. I took the idea from the bolster of a common wagon first. Actual experience on the road showed me the advantage

of having the wheels close together. The placing of the wheels close together was not an accidental discovery, nor was it discovered from the want of knowledge of the effect produced by it. This invention, at the time of its being first used or invented by me, was regarded as an important invention on the said road, and was always considered by the hands who worked on the road as my invention. In the first passenger car that was made on this principle, the running gears or trucks were made by my drawings under my directions, and I ordered and obtained all the materials necessary, at the expense however of the Company, (the Baltimore and Ohio Railroad Company.) I am little at a loss about the date, but I think this was in 1832, and I am pretty certain it was in 1832. After this, two or three other passenger cars were made on the same principle by my direction and from my drawings, and all of them were made previous to October the first, 1834, the date of Mr. Winan's patent.

I considered that precisely the same advantages would be obtained in adopting and using this invention on passenger cars, as I have detailed was obtained in its use on burthen cars. The evil I have mentioned, in placing timber or hogsheds on the car, was a difficulty which occurred in loading the cars. In making the passenger cars, the sole object I had in view was to carry out the principle which I have before stated; that is to say, to enable the cars or trucks to pass through curves and switches easier and with less friction.

I have frequently examined the eight-wheel passenger cars which are run upon the Baltimore and Susquehannah Railroad, the Baltimore and Philadelphia Railroad, and the Baltimore and Ohio Railroad, and I have seen no difference of principle in these cars from the principle discovered and used by myself, as herein before stated. I have been eye-witness to some sixty or seventy burthen cars (eight-wheels) built recently by Mr. Dennread of this city, and the principle is precisely the same.

I have heard read and know the contents of the specification marked S. P., and in my invention the danger from oscillation and swinging from side to side was obviated, and the cars were enabled to pass through the curves and switches at any speed without this oscillation, and this would prevent the liability to breakage and tend to the safety of the passenger cars. My invention prevents oscillation at all times, as well on a straight line of the road as on the curves. The principle of my invention, and the principle set forth in the specification S P, I consider as the same, that is, all that is material to accomplish the objects. The fact is, I consider that there is no invention about it, except the principle involved in enabling the truck or running gears of the car to pass with ease through short curves or switches under a heavy load or burthen, and I believe that the eight-wheel car is adapted to any road, straight or curved.

Q. You have already stated, that at the time of constructing the passenger car on the principle of your invention, or application of a principle, oscillation was prevented in the running of the cars; was this oscillation prevented as well on a straight road as at curves, and did the principle of your invention, which adapted the workings of the car to the curves also operate in a degree while the car was in motion on a straight road?



(The above question is objected to by Mr. Winans, as a leading question.)

A. Yes.

Being *cross-examined* by Ross Winans, the Plaintiff, the said witness answers and says:

I had the direction of the car building, smith-work, passenger car building, and bought all the materials pretty much that were used; I kept all the time, and paid all the hands under me, while in the employ of the Baltimore and Ohio Railroad Company. The first timber carried on eight-wheels on said road, was carried on two ordinary four-wheel cars, used for carrying stone. As to the date, I cannot ascertain it, but so soon as we became acquainted with the advantages of using the eight-wheel car, we made the centre timbers stronger, and placed the wheels closer together; this was done in the latter part of 1831, or along through 1832, certainly in one of those years or the other, and before the building of the eight-wheel passenger cars. At this time the moving power on the said road was horse-power. Some experiments in steam-power were made. Up to the time of the construction of the first eight-wheel passenger car, the power was applied to the truck and not to the body of the car, as it is at present. The trucks were coupled together (independent of the load) by a coupling bar, and not by a body, as at present, but before I left the road, the Columbus, (the first eight-wheel passenger car,) which was coupled by a coupling bar, had also a body for passengers placed on the trucks as a permanent fixture, and it strikes me that this was the first eight-wheel car on said road, having a body as a permanent fixture.

The following, within parenthesis, is inserted at the instance of the Defendant's counsel:

(Here the Plaintiff produced and exhibited to the witness a drawing, and asked the witness if he had that drawing before him at the time he (the witness) constructed the Columbus; to which the witness answered: I recollect distinctly of the drawing of a body of a car, from which the body of the Columbus was made; the Plaintiff, I think, furnished said drawing. For the running gear, I made the drawings myself to work by. The body built after said drawing had a special reference to an eight-wheel car. There was a drawing of the body of a car came into my possession, which body, I think, was painted yellow. While said drawing was in my possession I do not think there was any running gear attached to it.)

Here the Plaintiff was informed that if the drawing then produced was intended to be used for the purpose of examining the witness upon it, the paper must be filed with the Commissioner, whereupon the Plaintiff said that he did not want the paper to go out of his possession, and would withdraw it and decline any examination of the witness in regard to it, but at the same offered to allow a copy to be made and used, if the opposite party wished.

X Q 1. Did you not enter the service of the Baltimore and Ohio Railroad Company in April, 1830? and was not the Plaintiff then in the same service? or if not, when did he enter the service to the best of your recollection? and did he not continue in it afterwards, as long as you did and after you left it? and what was the nature of his employment?

*Ans.* I entered into the service of said Company in April, 1830. I do not recollect that the Plaintiff was in the service of the said Company at that time; I think he was in England. I have no knowledge of the time particularly when the Plaintiff entered said service, but I think it was in the latter end of the same year. I have no knowledge of said Winans being in the service of the Company receiving wages. I have no doubt of his being in the employ of the Company, but the year and wages I don't know; as far as I know of Plaintiff's employment he was Superintendent over the various machinery departments.

*X Q 2.* You have stated that the car Columbus was your invention. Please state whether it was the same in principle and mode of operation with the eight-wheel cars now in general use; and if not, what is the difference?

*Ans.* In reference to the action of the body of the car Columbus on the running gears, I consider it the same as the eight-wheel car now in general use. There is a difference between the cars now and the Columbus in the connection. The point of traction was from the perch in the Columbus to the body. I think this is all the material difference.

*X Q 3.* What, in your opinion, is the principle of the eight-wheel car now in general use, and was this principle in the car invented by you as stated in your examination in chief?

*Ans.* The principle of an eight-wheel car I consider to be, in placing a frame work on the fore wheels, and so connected with the body or load as to enable the truck or running gear to move with ease under the load by the body resting on a point at the centre of the truck or running gear, the wheels being brought as near together as possible so as not to touch, and place at a proper distance from each end of the car or load. This enables both sets of wheels or trucks to move at any angle from a right to a straight line. This principle was in part in the car Columbus invented by me, with this difference: that the body and frame work were prepared for Mr. Winans' friction wheels, which at that time were too far apart to carry out the principle successfully and properly, I not having control entirely of the distance the wheels were placed apart. This was afterwards altered, and the wheels placed closer together. We certainly altered the boxes on the Columbus and put the wheels closer together.

*X Q 4.* What was the distance apart of the axles of the stone cars which you have stated in your examination in chief were used for carrying lumber, and what was the diameter of the wheels of such stone cars?

*Ans.* The axles of the stone car referred to were not confined to any particular distance apart, but were generally from 2 ft. 8, to 2 ft. 10 in. apart. As near as I can recollect the wheels were 26 inches in diameter on the tread, 28½ inches on the flange.

*X Q 5.* What was the distance apart of the axles of the trucks under the Columbus as originally built?

*Ans.* I do not recollect the exact distance, but it seems to me the flanges of the wheels were placed fifteen inches apart.

*X Q 6.* What was the kind of wheel and axle in most general use on the Baltimore and Ohio Railroad at the time of the building of the Co-

lumbus? Was it not the Winans' friction wheel, with outside diminished bearings?

*Ans.* A number of passenger cars on said road had the Winans friction wheel. I think it likely that a majority of the passenger cars were built on Mr. Winans' plan. I think there were some passenger cars built without the friction wheel, at the time of the building of the Columbus.

*X Q 7.* Was not the Winans' friction wheel in great and general favor at the time of the building of the Columbus?

[Defendants' counsel objects to the above question because it refers to the opinion of the public—to general opinion—and not to witness' own opinion or knowledge.]

*Ans.* I would simply say that the said friction wheel had not the favor of competent judges. There was a very short period of time when it was in favor, but not by competent judges.

*X Q 8.* Was not the Winans' friction wheel in favor at the time of the building of the Columbus, with the officers and parties who took an active interest in the affairs of the Baltimore and Ohio Railroad Company?

[This question is objected to.]

*Ans.* I don't think I can answer this question in the affirmative, from the fact that there were defects in every car that was built. I was going to state that there were defects in every car that was built in modifications and changes in the plan of building, and I have my doubts whether the patentee himself of the invention was satisfied of its efficiency. It was a good deal like the Fayette Street Bridge. I believe there was a time when the friction wheel was regarded with favor by the officers and parties who took an active interest in the affairs of the Baltimore and Ohio Railroad Company.

In answer to the question of the Plaintiff, as to whether the officers and those who took an interest in the Railroad Company did not hold Winans' friction wheel in favor, the witness desired to know who were meant by the word "Officers;" and he stated that the President and Directors, as far as he knew, were in favor of said friction wheel.

The last seven lines, beginning with the words "in answer," were dictated by the Defendants' counsel, as his understanding of what the witness had previously stated, and had not been taken down by the Commissioner; the said witness being present and confirming the statements therein contained.

*X Q 9.* You have said, I believe, there was a time when the friction wheel was regarded with favor by the officers and parties who took an active interest in the affairs of the Baltimore and Ohio Railroad, as explained in your answer to the last question. Was this at the time of the building of the Columbus?

*Ans.* I want to know in favor of whom you mean. The friction wheels were less in favor at the time of the building of the Columbus than previously.

*X Q 10.* What was your own opinion of the Winans' friction wheel at the time of the building of the Columbus?

*Ans.* My own opinion was that there were defects in the principle of the invention that could never be remedied, so as to make it efficient.

*X Q 11.* Did not Mr. Winans furnish you with the plan, and direct

you in the construction of the running gear, as well as of the body of the Columbus, or did any one else, or was the plan of the eight-wheel car your own invention?

*Ans.* Mr. Winans did not furnish me with the plan and direct me in the construction of the running gear as well as the body of the Columbus. As far as my recollection serves me now, I drew down the plan on a scale of an inch and a half to the foot on a board, which I worked by, giving lengths and sizes, &c., and obtained the materials without reference to any other plan than my own.

*X Q 12.* If you were, as already stated by you, the inventor of an eight-wheel car, and built the running gear without being furnished with a plan by Mr. Winans or any one else, how came you holding the opinions of the friction wheel which you have expressed, to adopt it for the running gear of the Columbus?

*Ans.* Well, the reason was, that Mr. George Brown had the immediate direction of all such matters, and I generally worked from his directions, as to the quantity and quality of the cars to be made. I do not know that I used the friction wheel under Mr. Brown's directions. I had used the friction wheels on other cars, and knew how to make them as well as Mr. Winans, and without his directions. It was not my province to reject the said wheel, and the principle of it had been adopted by the Company.

*X Q 13.* Do you say that you put friction wheels under the Columbus, because the friction wheel had been adopted by the Company without any particular directions from any one to do so? Did Mr. Brown direct you to put the friction wheels on the car?

*Ans.* I cannot pretend to answer such a question as this from memory, and it being so far back. I have already stated that Mr. Brown had direction of these matters. I do not know that Mr. Brown directed me to put the friction wheel to the Columbus.

*X Q 14.* Was the friction wheel on all the cars belonging to the Company, and if it was not, what do you mean by saying it was adopted by the Company?

*Ans.* The friction wheel was not on all the cars belonging to the Company. I mean precisely what the City Council meant in adopting Cooper's plan of the Fayette Street Bridge.

*X Q 15.* What did the City Council mean?

*Ans.* The City Council advertised for proposals for building three distinct bridges. Three several plans were submitted to the Council, and were taken and bridges built, which is all I consider in adopting the principle.

*X Q 16.* Do you mean to say that there was a formal action of the Council adopting the Fayette Street Bridge, and that there was a formal action on the part of the Railroad Company adopting the Winans friction wheel which controlled you in building the Columbus, and that therefore the cases which you have put are the same, or what do you mean?

*Ans.* There was a formal action on the part of the Council adopting the bridges, and I suppose (but do not know of my own knowledge,) there was a formal action of the Railroad Company adopting Winans' friction wheel; I used the friction wheel on the Columbus because I supposed the Company had adopted it.



X Q 16 (?). Do I understand you to say, then, that you were governed in using friction wheels for the Columbus by your supposition that they had been formally adopted by the Company, and not by any direction from Mr. George Brown or others?

Ans. No. I am not to be so understood, because Mr. Brown had the specific direction of such matters, and the order or direction to do it came through Mr. George Brown.

X Q 17. Was not the car Columbus finished in the early part of the year 1831? Try and recollect.

Ans. I do not recollect precisely the time, it was in pleasant weather that the said car first went out.

X Q 18. Look at the drawing now shown you marked A. B., and say whether it is not an accurate representation of the car Columbus to the best of your recollection, and if not, in what respects it is erroneous?

Ans. I have looked at said drawing marked A. B., and to the best of my recollection it is an accurate representation of the car Columbus.

X Q 19. When you built the car Columbus as testified by you, were you not in the habit of consulting with George Brown, George Gillingham and Ross Winans, in reference to said car, and was not the said Winans constantly going backwards and forwards to and from the shop in which the car was built?

Ans. I do not know that Mr. Gillingham was ever consulted, but Mr. Brown and Mr. Winans were. Mr. Winans was frequently in the shop where said car was being built.

X Q 20. Did not Mr. Winans direct you in the construction of the trucks of the Columbus so far as his friction wheels were concerned, and was not the use of the perch directed by him, or was it your own idea?

Ans. The perch had been used on every car that was built, I believe. I do not pretend to say now whether Mr. Winans did or did not direct me in the construction of the trucks of the Columbus, so far as the friction wheels were concerned.

X Q 21. At the time of building the Columbus, did you understand the advantages of the free motion of the trucks of an eight-wheel car upon the centre pins?

Ans. Certainly I did.

X Q 22. How came you then to use a perch to draw by, which controls such free motion? How came you to use it, if it controlled the free motion at all?

Ans. I did not say that the perch controlled the free motion of the car, only in part. I used the perch at all because it was the only plan in use at the time.

X Q 23. Did you understand the advantage of having the wheels of each truck of an eight-wheel car close together when you built the Columbus?

Ans. I understood the advantages of having the wheels close together under any burthen or load. There was no passenger car built at that time.

X Q 24. In inventing the eight-wheel car, as already claimed by you, or in planning the construction of one, had you in view any advantages to be derived from putting the wheels of each truck close together,

and were two trucks with the wheels close together a part of your invention or plan, of which you understood the advantages as particularly applicable to eight-wheel cars?

*Ans.* I do not know that I ever claimed the eight-wheel car as my invention. In planning the construction of an eight-wheel car, I certainly had in view the advantages to be derived from putting the wheels of each truck close together. I understood the advantages of placing the wheels close together in reference to any purpose for which cars were used on the road. The advantages of putting the wheels of the truck close together are applicable to no other car but eight-wheel cars.

*X Q 25.* You have already stated that you did not put the wheels of the trucks close together in the eight-wheel car Columbus, because of the employment of the Winans friction wheel. Will you look at the drawing A. B., now shown you, and explain in what manner the use of the friction wheel prevented your placing the wheels as close together as their diameter would allow?

*Ans.* I have looked at the drawing A. B., and I do not know whether I am able to state why, in this case, the wheels were not put nearer together, but I suppose it was because other cars had been built in the same way.

*X Q 27. (?)* Would you not have put the wheels close together had you not been controlled by directions given to you in regard to the construction of the running gear?

*Ans.* The distance had been adopted previously; the distance between the axles on other cars had been adopted previously.

*X Q 28.* In speaking of the adoption of the distance of the wheels apart, previously, have you not reference to four-wheel cars with the Winans friction wheel?

*Ans.* Yes.

*X Q 29.* The car Columbus then, was nothing more than a long car body put on the running gear of two four-wheel cars. Was it, or was it not?

*Ans.* As it relates to the connection of the wheels and the friction wheels, and the distance of the axles apart, it was the same as the four-wheel car; but as respects the bolster or point on which it turns, there was a material difference; the four-wheel car having nothing of the kind.

*X Q 30.* The car Columbus then, was a long car body put upon two sets of running gear or trucks, constructed, as relates to the distance of the wheels apart and the mode of traction by a perch, upon the plan used for the four-wheel cars.

*Ans.* It was with this exception, that there was only one point of traction at each truck.

*X Q 31.* Do you consider the position of the trucks under the body of an eight-wheel car a matter of indifference, or do you consider one position better than another? and if so, what position do you prefer? Were the trucks which were placed under the Columbus in the first instance in their proper position, and are the trucks of eight-wheel cars as now built usually, or ever, placed in the same position with those of the Columbus?

*Ans.* I think the trucks of eight-wheel cars as now usually built, are

placed near (?) the ends of the body than those of the Columbus. I do not consider the position of the trucks a matter of indifference. I certainly consider one position better than another, and this depends somewhat on the strength of the body. It was thought, no doubt, at the time the Columbus was built, and most likely it was thought so by me, that the trucks were placed in the proper position.

*X Q 33. (?)* Who directed you to place the trucks of the Columbus as shown in the drawing?

*Ans.* I do not know that I had any specific directions about it, further than my own judgment.

*X Q 34.* In your examination in chief you say, the invention when first invented by me was regarded as an important invention. Did you ever claim it as your invention? and if so, to whom did you make such claims?

*Ans.* In answer to this question, I would simply state that I had authority from Mr. Brown to make any improvement, and to make any patterns that I saw fit to carry out any improvement suggested to my mind, so it did not run the Company to unnecessary cost, in carrying out any new idea which was suggested to my mind; I made the improvement in using the trucks and swivel bolster on the trucks for carrying long timber. I do not know that I made the claim particularly to anybody further than to talk the matter over to persons I was acquainted with. I made other improvements and carried them out, one other improvement, (considered so then) that is a spring working in a cast iron socket, and this improvement was generally adopted on the road. I always claimed the swiveling principle as my own invention.

*X Q 35.* Was the shop in which you worked within two or three feet of the shop in which the body of the Columbus was being built under the charge of Oliver Cromwell, and were you not constantly in and out of Cromwell's shop? Did not Reuben Aler work in either the same shop with you or in Cromwell's shop, at the Columbus or parts of it? Did you ever claim the invention to Cromwell or to Aler?

*Ans.* I think the body of the car Columbus and Cromwell himself were under my charge, and the shops adjoined as stated in the interrogatory. There was only room between them for a person to pass, and hardly that, and I was as often in Cromwell's shop as was necessary. Oliver Cromwell worked in one shop, and I worked in the other. Reuben Aler worked in the back end of the shop in which I worked, but I do not recollect whether he worked there when the Columbus was being built. I do not know that I ever claimed the invention to either Cromwell or Aler, but I did to Jacob Rupp who worked on the running gear.

*X Q 36.* Do you say that the idea of trucks with swivelling bolsters for carrying long timber was your invention or improvement? Did you not on the trial in Baltimore in 1839, swear that the idea was suggested by a driver on the road?

*Ans.* Yes, I do say that the idea of trucks with swivel bolsters for carrying long timber on railroads was my invention. I did not, to my knowledge, swear on the trial in Baltimore in 1839, that the idea was suggested by a driver on the road. This driver came into the shop and asked me whether or not I could construct something or fall on some plan to carry timber upon the road; that the great length made it very

difficult to get it upon the cars then in use. I think I told him that I could, and immediately went to work and had them made.

X Q 37. Did you not, on the said trial, state on oath that you did not claim the invention of the Columbus, and that you did not know any one who claimed it, or to this effect?

Ans. The swiveling principle I always claimed, as well in the Columbus as any other car. As to the body or the distance of the wheels apart under the Columbus, I made no claim that I know of. I do not know that I ever claimed any thing in reference to the position of the trucks under the body as to their distance.

X Q 38. To whom of the officers or directors of the Railroad Company did you first suggest the plan of a railroad passenger car with eight wheels before the Columbus was built, and from whom did you receive instructions to go on and build such a car, and did you without direction from any one go on and build the car of your own notion?

Ans. I do not know; I received my orders from Mr. George Brown. I did not consider myself under the orders of any one else.

X Q 39. Was not Mr. George Brown very active in attending to the making of the cars and machinery of the road in 1830, 1831 and 1832? Did you state to him at any time that you had invented a new kind of car which you wanted permission to build, or did you make such a statement or request to Mr. Thomas, the President, or to Mr. Winans, or to Mr. Knight, the Chief Engineer?

Ans.. Mr. George Brown was very active at those times. I do not know that I stated to Mr. Brown that I had invented such a car, which I wanted to build. I do not know that I made it to Mr. Thomas, or to Mr. Winans, or to Mr. Knight, the Chief Engineer.

X Q 40. Did you exhibit a drawing of any kind to any of the officers, or directors, or agents of the Company explanatory of your alleged invention, prior to the building of the Columbus, and to whom? or, if not, how did you explain your alleged invention to them?

Ans. I showed nothing more than the drawings I had made on the board of which I have spoken, which I showed to the workmen, and which I had drawn to work by.

X Q 41. You have stated that the Plaintiff furnished a drawing of a car body from which the body of the Columbus was built, had you at that time explained to him or any body else your alleged invention, or had you, when he furnished the drawing, any conversation with him in regard to the position of the trucks, and if so, what was it?

Ans. I do not recollect the conversation which took place when Winans furnished the drawing.

X Q 42. In your examination in chief you say, actual experience on the road showed me the advantage of having the wheels close together, will you now state how many miles of the Baltimore and Ohio Railroad were open and in use for purposes of transportation in 1831 when the Columbus was built, and whether the Company was then engaged in general transportation, and to what place?

Ans. I think the road was open and in use as far as Ellicott's Mills, (fourteen miles.)

X Q 43. In your examination in chief you say, when speaking of your alleged invention that it was suggested by the fact among others, that sometimes in loading a hogshead of sugar or other articles, they



rolled to the end of the car and tilted the end down, will you now state whether you ever saw a hoghead of sugar loaded on a railroad car of the Baltimore and Ohio Railroad prior to the spring of 1831, and if so, where was said hoghead loaded?

*Ans.* I saw a hoghead containing some article put on the road, but I cannot say whether it contained sugar, and it appears to me that this was soon after the road was finished to Ellicott's Mills, the date I do not recollect. It was loaded at Mount Clare depot.

*X Q 44.* Did the Columbus succeed to your satisfaction when put upon the road on completion, or was it altered from time to time, and if so, in what respect? You will here describe particularly.

*Ans.* The Columbus when put on the road did not succeed to my satisfaction. It seems to me that there was some defect in the bolster pin. There was a stairway made inside afterwards. It strikes me there were new running gears put under it before it wore out; they were put on for defects in the friction wheels.

*X Q 45.* Had you determined or had you been ordered to build an eight-wheel car, before you received the drawing of the body from Mr. Winans?

*Ans.* I had not.

*X Q 46.* Did you ever ask the said Plaintiff, or any one else, to furnish you with the drawing of an eight-wheel car?

*Ans.* I did not. There was no necessity for it, because I could make a drawing myself.

*X Q 47.* How came such a drawing to be furnished you if the invention was your own, and you had never explained it to said Plaintiff, or requested that you might be furnished with a drawing from him or from any one else?

*Ans.* I do not know Mr. Winans's motive for bringing the drawing to me. I suppose he got authority from the Company to do so.

*X Q 48.* Was the drawing furnished before or after the Columbus was commenced?

*Ans.* The drawing of the body of the Columbus was furnished before the Columbus was commenced.

*X Q 49.* Will a train of eight-wheel cars, with couplings attached to the trucks or perches, pass as easily through curves and turnouts as a train of cars with couplings attached to the bodies of the cars, the trucks being left free to yield to the curve or turnout?

*Ans.* I should suppose not.

*X Q 50.* Were trucks ever built expressly for the purpose of carrying timber before the building of the Columbus, or were not the trucks used for timber the common four-wheel cars appropriated to that purpose as wanted?

*Ans.* I am not certain; but it appears to me that some few were built before the Columbus, but I am not certain.

The examination in chief being resumed, the said witness, Conduce Gatch, deposes and says as follows:

*Q.* You have seen the drawing shown you by the Plaintiff, on Monday's examination, and afterwards withdrawn by him, purporting to be the drawing of the model of the Columbus built by you. State whether your recollection is distinct that the running gear, as now

shown on that drawing; was or was not in the drawing before you constructed the running gear of the said car, and state what your testimony was on this point, on the trial of the case between Ross Winans and the Newcastle and Frenchtown Railroad Company—a case tried in the United States Circuit Court, for an infringement of Mr. Winans' patent of eight-wheel passenger cars, spoken of in this case?

*Ans.* It has always been my impression that the body of the car, as it appears on said drawing, was alone on the drawing shown to me before the commencement of the building of the Columbus. The said drawing was some time in my possession. In said drawing, the coloring of the running gear and the execution of the running gear are different from those of the body, and in my examination in the case referred to, my attention was drawn to this by some one who examined the said drawing during the trial of said case.

*Q.* Had you, or not, testified in said case that the running gear was not on the drawing before Mr. Ellicott made the suggestion?

*Ans.* Yes; I had so testified.

*Q.* You have said, in your cross-examination, that the friction wheel of Mr. Winans was defective, and pretty much like the Fayette Street Bridge. Explain what you mean by that answer.

*Ans.* I meant that it soon came to life and soon was extinct; that is, out of life and out of use. The Fayette Street Bridge fell down before its completion.

*Q.* After the running gear of an eight-wheel car is constructed upon the principle of your invention, would it not be, in your judgment, within the competency of a mechanic of usual skill to place the body of an eight-wheel car upon the same, so as to work successfully and in like manner with the eight-wheel passenger car of Mr. Winans, or is any new principle of construction adopted in the building of a framework of the body?

*Ans.* Yes. There is no new principle in the construction of the body to adapt it to the running gear of an eight-wheel car.

*Q.* You have stated that you made the running gear of the Columbus by your own drawing, made upon a board with the dimensions marked on it. State who was working with you on the running gear; and did you receive any instructions from Winans, or any body else, as respects the construction of the running gear?

*Ans.* Jacob Rupp was at that time working with me; and I do not recollect to have received any instructions from Mr. Winans, or any body else, as respects the construction of the running gear.

*Q.* Had Mr. Winans any opportunity of seeing the application of the principle of your invention applied in actual use on the cars upon said railroad? and do you know of his having seen it in use?

*Ans.* Certainly, Mr. Winans had an opportunity of seeing my principle in operation. I suppose he saw my principle in operation; Mr. Winans was on the road, and passing up and down.

*Q.* Are Winans's friction wheels in general use on the eight-wheel passenger cars?

*Ans.* None of them are now in use, to my knowledge.

*Q.* When you say that swivel trucks, with bolsters for carrying long timber on a railroad were invented by you, did you mean that that object alone was effected? and did, or did not, the principle of your

invention produce all the advantages mentioned in the specification of patent S. P.

*Ans.* Certainly, my principle attained all the advantages mentioned in the specification S. P., and all the advantages now derived in the use of the eight-wheel car now in general use throughout the United States. The eight-wheel car now in use would be useless without the swivel principle.

*Q.* Were you not sufficiently acquainted with drawing at the time of building the Columbus, to enable you to make the drawing of the running gear and any description of drawing requisite, as a model for your work?

*Ans.* Yes.

*Q.* Did you ever hear Mr. Winans claim as his invention the principle of the running gear of the Columbus, or any eight-wheel passenger car, at or before the time of the building of the Columbus? and when did you first hear of his claim as an inventor of an eight-wheel passenger car?

*Ans.* I never heard at or before the building of the Columbus, Mr. Winans claim as his invention the principle of the running gear of the Columbus, or any eight-wheel passenger car, and I never heard of his claim until after his patent was taken out.

*Q.* Having heard read the specification of Mr. Winans' patent, and what improvement he claims as having made in the manner of arranging and connecting the eight-wheel cars, which constitute the two bearing carriages with a railroad car, is there any thing new in principle as set forth in said specification, and was known to you before the date of his patent, viz: October 1st, 1834?

*Ans.* I think not.

CONDUCE GATCH.

#### DEPOSITION OF ROBERT S. HOLLINS.

Questions put to ROBERT S. HOLLINS, a witness for Defendant, deposes and says as follows:

I reside in the city of Baltimore, and am Secretary of the Baltimore and Susquehannah Railroad Company, and have been since 1835. I am acquainted with the manner of constructing the cars, both passenger and burthen, on said road. There are eight-wheel passenger cars on said road, and the first of said cars which were run on said road were built by Dexter C. Force, who then resided in Baltimore, and the rest of said cars were built at the depot of said road; James Milholland is the foreman at said depot; on said road they find that the eight-wheel cars run with greater ease on the road than the four-wheel cars, and with greater safety to the passengers. This is effected by having eight wheels instead of four, and the eight wheels are on trucks separate and distinct from the body of the cars, by which they are enabled to give great length to the cars, and prevent the pitching generally attending the running of a four-wheel car at high speed, and this pitching is prevented by being enabled to bring the trucks on which the body is supported near the end of the body. The eight-wheel car also adapts itself to the curves of the road.

*Q. 2. (?)* Were the four-wheel cars you have stated to be in use on the

road, constructed in the same manner as regards the running gear as the eight-wheel cars?

*Ans.* No; they were not constructed in the same way. They are entirely different, because the body and the running gear of a four-wheel car form one and the same thing; the body of an eight-wheel car is separate and distinct from the trucks of an eight-wheel car, they being connected by coupling pins running through the centre of the truck frame, and the coupling pin is the connection between the body and the trucks; and if the coupling pin were to break, the body would separate from the truck. I do not see any difference between the running gear of an eight-wheel car, as used on the Baltimore and Susquehannah Railroad, and a four-wheel car, except that the wheels are a little closer generally, and that the trucks are always made much stronger than those for a four-wheel car in order to bear the increased weight put upon them.

We find it a disadvantage to have a four-wheel car going at great speed on the road. You could not run a car of the length of an eight-wheel car on four wheels on our road; it is necessary to have trucks to get round the curves, and running the car on trucks is like running a series of four-wheel cars; the action is nothing more or less than taking cars connected and stretching them on a curve, then take two car bodies built for an eight-wheel car and lay one body on two of the four-wheel cars, and attaching that body to the cars by a pin in the centre of each car, and this shows the operation of the trucks adapting itself to the curves. The bodies in both descriptions of cars are made alike, except that the body of an eight-wheel car is longer, and that at the point of support between the body and the truck there is a heavy timber put in, known as a bolster, and that between the running gear there is also across the centre of the truck or running gear a heavy piece of timber (or iron, I have seen iron ones.) On our road, it is a heavy piece of timber which forms a part of the body, and also a part of the running gear of the car.

I have heard read the specification marked S. P., and I know of no difference between the description there and the cars used on our road, except the wheels used in our cars are not placed as close together as they might be according to the description in the specification S. P. There is not anything in the principle of the construction of our cars which would prevent the wheels being brought close together, if it were deemed expedient to do so. The eight-wheel cars and all eight-wheel cars have their wheels put close together to avoid the friction mentioned in the specification S. P. The effect of the friction is the same as is described in the specification, namely, injury to the wheel and injury to the rail.

In constructing four-wheel cars the object is to get the wheels as close together as possible to avoid this friction, and in a four-wheel passenger car the ends of the body project over the axles of the wheels a considerable distance, and at high speed the body naturally gets a pitching motion, which motion is avoided in the eight-wheel car. On a straight road the four-wheel car would pitch as much and probably more than it would on a curved road, when going at high speed. I have never seen a straight road. On our road the eight-wheel car runs with less vibration than the four-wheel car, and this promotes the ease of the



passengers. At the time the eight-wheel cars were built on our road, Isaac R. Trimble was the Engineer of the said road.

On reflection I state, that for the first cars built for the Company the trucks were made by Ross Winans. The cars built by Force were built under the direction of Mr. Trimble, who was at that time the Engineer of the road. Mr. Trimble the Engineer, sent an Engineer to Newcastle to get the drawings for four and eight-wheel cars, and this was about the time Force built the cars for the Company. When Mr. Winans built the trucks above spoken of for our Company, he sent a young man to take the dimensions. The said trucks were built under the direction of Mr. Milholland, the Superintendent of Machinery on our road. Said Ross Winans is a machinist, and has done work for our Company at different times; he has cast wheels for us, made patterns, but I do not recollect of any machinery at this moment, except the trucks above spoken of. Said Winans has brought no suit against our Company for any infringement of his patent. I have an indistinct recollection of a letter of Mr. Winans to the Company, but whether it was about this patent I do not recollect. I think said letter was a claim made by Winans against the Company for the infringement of a patent. I will furnish a copy to be annexed. (See letter on page —.)

*Cross-interrogatories addressed by Plaintiff to Robert S. Hollins.*

X Q 1. Have you ever been engaged practically in the construction of cars or machinery of any kind as a business, or are you an engineer by profession?

Ans. No.

X Q 2. What is the date at which the first eight-wheel cars used by the Baltimore and Susquehannah Railroad were constructed?

Ans. In August 1838, (eighteen hundred and thirty-eight) the first eight-wheel cars used by the Baltimore and Susquehannah Railroad Company were constructed.

X Q 3. You state, in your examination in chief now referred to, the difference between an eight and four-wheel car, and the comparative advantages of the two. Do I understand you to say that these are all the advantages?

Ans. In an eight-wheel burthen car you can probably carry more articles than you could in two four-wheel burthen cars. In speaking of articles, I mean some articles; for in regard to the article of iron, you can take as much in one description of car as in the other. In an eight-wheel passenger car you can carry more than double the number of passengers you could carry in one four-wheel car; you are enabled to construct the car on eight wheels so much longer.

X Q 4. In view of the advantages believed by you to exist in an eight-wheel car, was it not a valuable and important invention in your opinion? and is it not now, so far as your knowledge goes, in general use throughout the United States?

Ans. I answer in the affirmative, Yes.

X Q 5. Is not an eight-wheel car a machine perfect in itself, and dependant for its most advantageous action upon the proper adjustment of its parts, in their relations one to another?

Ans. Yes.

X Q 6. Is not the point of traction of the running gear of a four-

wheel car on front of the car, and does not this, together with the rubbing of the flange on the rail, control the direction of the wheels? Is not the point of traction of the trucks of an eight-wheel car in the centre of the four wheels of each truck, and are not the wheels thus left free to be controlled by the curves and inequalities of the road?

*Ans.* Yes; I answer to both in the affirmative.

*X Q 7.* Can you take two sets of running gears of four-wheel cars as now constructed, or as constructed in 1834, and without altering or preparing them in any respect, or adapting them to their new purpose, convert them into an available and useful eight-wheel car, by placing a long car body upon them?

*Ans.* No, not without alteration and adaptation for that purpose. That is to say, you must put a bolster on the top of the four-wheel cars, connect the body to them by coupling pins, and bring the axles closer.

*X Q 8.* Would it not be better and cheaper in all respects to build new trucks, especially adapted to the use of eight-wheel cars, rather than undertake the alteration of two four-wheel cars, as running gear for that purpose?

*Ans.* Certainly it would.

*X Q 9.* Are not the difficulties to be overcome by the use of an eight-wheel car, and the best mode of overcoming them clearly set forth in the specification S. P., and are not the eight-wheel cars now in general use, according to the best of your knowledge, constructed upon the principle therein explained?

*Ans.* Yes, but I have no reference to the pretensions of Winans as patentee.

*X Q 10.* What was the date of taking the dimensions of cars on the Baltimore and Susquehannah Railroad, by or on the part of Mr. Winans, of which you have spoken in your examination in chief?

*Ans.* I think it is about a year ago.

*X Q 11.* In the construction of an eight-wheel car, is there any new principle in the construction of the body of the cars differing from those of a four-wheel car, and could not a four-wheel car body be placed on an eight-wheel running gear, and if not, what special alteration must be made?

*Ans.* It is no part of my duty as Secretary, but having a turn for mechanics, I turn my attention at times to the various improvements in Railroad cars, and examine such as are made and in use on the road of which I am Secretary. I think I have sufficient knowledge to judge of the effect produced by the adoption of the principle of construction of railroad cars. In referring in my answer to the third cross-interrogatory to the advantage of an eight-wheel passenger car in carrying more passengers, I mean this in addition to the advantages mentioned in my answer in chief. The eight-wheel cars in use on our Railroad fulfil all the conditions of the specification S. P. The cars built by Mr. Force were built on the same principle as those now in use on the road, and of all eight-wheel cars on the road—the principle is the same—in some the wheels may be heavier and the timber may be heavier in some, but the principle is the same.

*X Q 12.* Explain the difference in principle, if any exists, between the action of a wagon having on a single bolster and an eight-wheel

passenger car, and what would be requisite to make the principle on which a wagon is turned apply to the running of an eight-wheel passenger car, and what is the necessity of a swivel bolster?

*Ans.* The frame of a body of a four and of an eight-wheel car are similar, except the difference in the length of the two, and that the body of the eight-wheel car has an upper bolster for the purpose of supporting the weight of the body, and forming the socket for the coupling pin. The running gear of a four-wheel car and the truck of an eight-wheel car are similarly constructed, except that the axles of the trucks are placed closer together and that the said trucks have an under bolster, I believe this all the difference. In all our cars the upper bolsters is a fixture of the body, and the under bolster is a fixture of the running gear. In the common road wagon the upper bolster is separate and distinct from the body of the wagon and also from the lower bolster; the lower bolster is attached to the axle and forms a part of it. The principle is the same in the bolster of a common wagon and the bolster of an eight-wheel car, but it is not operated in the same way; the operation of the turning of a wagon is by the moving power, and in an eight-wheel car it is by the curvatures and inequalities of the road. We have transported lumber on our road on two four-wheel cars, but then it has been done by adding bolsters to the cars.

**X Q 13.** Is the body of an eight-wheel car before being placed on the truck or running gear different from a four-wheel car in any other respect than dimension in length and addition of a bolster?

*Ans.* I consider the forward trucks of a railroad car as the same in principle as the front bolster and wheels of a wagon, and the difference is that the hind wheels of the wagon are in place of the hind wheels of the car, and as the hind wheels may be considered as a permanent fixture, the hind truck to be the same in principle with the hind part of the wagon should be permanently fixed to the car body, and therefore would be useless on a railroad.

**X Q 14.** In constructing an efficient eight-wheel car must there not be such a construction of the body in reference to the trucks as to unite the two safely and permanently together for the regular transportation of passengers or merchandise?

*Ans.* No, there is a difference. The eight-wheel cars which I have seen have always been alike in principle, and the wheels and axles of such cars have been arranged in the manner set forth in the specification S. P. I have heard read from the said specification what the patentee claims as his invention, and I see nothing different in construction of the eight-wheel car patented, and the eight-wheel cars I have seen in use.

**X Q 15.** Are not trucks used in eight-wheel cars built for that purpose expressly? or do you take trucks constructed for other purposes, and use them without alteration as eight-wheel car trucks, restoring them to their former uses when not wanted for eight-wheel cars?

*Ans.* Yes.

**X Q 16.** Are not bodies used in eight-wheel cars built for that purpose expressly, or do you take car bodies constructed for other purposes, and use them without alteration in eight-wheel car bodies, restoring them to their former uses when not wanted for eight-wheel cars?

*Ans.* The bodies of eight-wheel cars are built especially for the purpose.

*X Q 17.* If two four-wheel cars standing on the road and built for general purposes are taken and used temporarily for the transportation of timber, as spoken of by you in your examination in chief resumed, is a permanent machine of well adjusted parts thereby produced, any more than a quadruped would be produced by the use of two men with pads on their shoulders to carry a long pole?

*Ans.* Trucks are constructed with especial reference to their use for eight-wheel cars.

*X Q 18.* In the examination in chief resumed, you explain the difference in the operation of the principle on which the common wagon operates from that of an eight-wheel passenger car in view of the hind wheels of the common wagon being stationary. Explain what addition or alteration must be made in the common wagon to enable it to operate on a road upon the same principle as the eight-wheel passenger car?

*Ans.* I answer in the negative. I consider the eight-wheel car body the same as the four-wheel car body, except that it is longer and has to be built stronger, because it has to be supported at the ends. To carry out the principle complete, instead of a single pair of wheels to the bolster of the wagon, there should be another pair, and in place of the hind wheels and axle being stationary, they ought to have a play on the centre of a bolster and an additional pair of wheels.

BALTIMORE, Dec. 14th, 1839.

CHARLES HOWARD, Esq.,

President Baltimore and Susquehannah R. R. Co.

Dear Sir:—At the close of my interview with you a few days since in regard to my claim for compensation for the use by the Susquehannah Railroad Company of my eight-wheel car patent, you expressed a desire to hear from me again before I made up my mind finally to decline the offer of compensation made me through you.

The sum named by me was five hundred dollars, that offered by you was three hundred and fifty dollars, to accept which would do more harm to my claim than the amount paid would compensate.

If my claim is a good one, my demand is most moderate. To accept of less would be to admit that it is doubtful or bad. This I could not do; the confidence of my counsel, settlement recently made after a full investigation, and under which I was paid what I would have willingly taken before suits were brought, would prevent my doing so were my own confidence less strong than it is. I must therefore respectfully adhere to my proposition as the most favorable one that I could offer you, and the terms of which are lower than they would otherwise be, were I not desirous to settle at once with the only road leading from Baltimore which has not yet admitted my right and paid me. Should you still decline acceding to my terms, I shall be obliged, as you must at once see, to bring suit in self-defence, and this must be done in the Court of Pennsylvania, into which State your road runs. The settlement of the case there will make the law of that State, where I have numerous claims to urge that would be settled at once on a decision in my favor against you there, but which might be opposed and resisted



were such a decision to be made in Maryland, the decision of the Circuit Court of which would have no binding authority on the Circuit Court in Pennsylvania. In thus speaking of a suit, nothing is further from my purpose than to do so by way of threat, or to induce you to a settlement that you would not otherwise make. I am most desirous to secure the good will of those who use my inventions, and I am anxious to satisfy you that the course I may have to pursue is not the result of temper on my part, but is intended to maintain what to my mind at least is an honest claim.

Very respectfully yours,

ROSS WINANS.

True copy from originals on file in this office.

ROB'T. S. HOLLINS,

*Sec'y Baltimore and Susquehannah Railroad Co.*

June 7th, 1848.

### DEPOSITION OF JOHN C. A. SMITH.

JOHN C. A. SMITH, for Defendant, deposes and says as follows :

I am now employed as foreman in the carpenter's shop for building cars of the Baltimore and Susquehannah Railroad Company, and have been in the employ of said Company since 1831 ; my knowledge of the construction of cars enables me to speak of the principle of their construction and action upon railroads. I consider the advantage of an eight-wheel car over a four-wheel car to be used on a railroad, to consist in this : that you could not construct a four-wheel car to carry the same burthen as an eight-wheel car ; the great difficulty in my mind would be to make the four-wheel car adapt itself to the curves. The difficulty consists in this : that in a four-wheel car you would have to place your wheels so far apart to support the load that it would not go round the curves. I speak of the use of four-wheel cars for general purposes. The principle of the eight-wheel car, which enables it to go round the curves on the road is, so far as I know, simply the bolster working on a pivot.

Q 2. (?) You have had read to you the testimony of Mr. Conduce Gatch, as to the principle of his invention as applied to the construction of eight-wheel railroad cars, and you have had read to you the advantages and objects to be obtained by the construction of the eight-wheel passenger car of Mr. Winans, as set forth in his specification of patent. State whether, in your opinion, all the objects claimed to result from the use of Winans' car are, or are not, dependant upon the same principle as that set forth in the testimony of Mr. Gatch respecting his alleged invention ?

Ans. I am now employed as foreman in the carpenter shop for building cars of the Baltimore and Susquehannah Railroad Company, and have been in the employ of said Company since 1831 ; my knowledge of the construction of cars enables me to speak of the principle of their construction and action upon railroads. I consider the advantage of an eight-wheel car over a four-wheel car to be used on a railroad, to consist in this : that you could not construct a four-wheel car to carry the same burthen as an eight-wheel car. The great difficulty in my mind would be to make the four-wheel car adapt itself to the curves.

The difficulty consists in this: that in a four-wheel car you would have to place your wheels so far apart to support the load that it would not go round the curves.

I speak of the use of four-wheel cars for general purposes. The principle of the eight-wheel car which enables it to go round the curves on the road is, so far as I know, simply the bolster working on a pivot. Yes, I consider that all the objects claimed to result from the use of Winans' car, are dependent upon the same principle as that set forth in the testimony of said Gatch respecting his alleged invention.

The Defendant's counsel asked the above question of the witness, he being an expert.

The said witness further says: I know Conduce Gatch, and his reputation as a workman is generally considered good. I have always understood that said Gatch was a good mechanic and builder of cars; said Gatch has superintended the building of cars to my knowledge. (Objected to by Plaintiff's counsel, because Gatch's reputation as a mechanic was not assailed.)

The witness further says: I do not consider there is any difference in the construction of the eight-wheel car and the four-wheel passenger car, except in the length of the former over the latter, and the bolster placed on the body of the eight-wheel car body. I don't see anything whatever in Mr. Winans' specification or the objects intended to be attained by his patent, which would not be accomplished by the ordinary truck being placed under the car body with four springs on the boxes. I have heard read the specification S. P., and there is nothing in what Winans claims different in principle from that set forth in Mr. Gatch's testimony. I understood Mr. Gatch's testimony to be, that he had a common wagon bolster to a four-wheel car, and I consider that this is all that is sufficient to adapt an eight-wheel car to be used on a railroad to advantage over a four-wheel car. In the four-wheel car, in going at a fast speed, there is a pitching motion and side motion.

X Q 1. What is the distance apart of the four-wheel car axles used on the Susquehannah Railroad?

Ans. The distance between the axles of a four-wheel car used on the Susquehannah Railroad is from forty-four inches to five feet.

X Q 2. What is the distance apart of the axles of the trucks of the eight-wheel cars used on that road?

Ans. We generally make them from forty to forty-four inches apart.

X Q 3. Do you think that the same advantages would be obtained by putting the axles of the trucks as far apart as the axles of a four-wheel car?

Ans. Well, so far as regards this, I must speak from experience. We have generally made the axles of the lime cars four feet and eight inches apart, and do not see that there would be any material difference if we were to make the axles of the trucks of the passenger cars as far apart.

X Q 4. Have you ever made the trucks of the passenger cars with axles four feet eight inches apart, and if so, when and how many?

Ans. We never made any with axles four feet eight inches apart.

X Q 5. Do you think the distance apart of the axles of trucks of eight-wheel cars a matter of indifference?

Ans. Yes, I do consider it a matter of indifference; I believe that

when you get the axles apart above the breadth of the road, there is a great difference.

*X Q 6.* Will a truck with axles four feet eight inches apart go through a switch or turnout, as easily and with as little friction as a truck whose axles are three feet four inches apart?

*Ans.* I do not know whether it will or not.

*X Q 7.* Are not trucks used in eight-wheel cars built for that purpose expressly, or do you take trucks constructed for other purposes and use them without alteration as eight-wheel car trucks, restoring them to their former use when not wanted for eight-wheel cars?

*Ans.* We make trucks used in eight-wheel cars expressly for such cars.

*X Q 8.* Are not the bodies of eight-wheel cars built expressly for the purpose, and with reference to their being properly and permanently attached to the trucks by suitable bolsters and bolster pins?

*Ans.* I answer in the affirmative.

*X Q 9.* What is the average length of the eight-wheel car bodies on the Baltimore and Susquehannah Railroad?

*Ans.* From twenty-eight to forty feet.

*X Q 10.* In a forty foot car, what would be the proper distance from each end of the upper bolster?

*Ans.* The distance is from six feet six inches to five feet, and this is the distance without reference to the length of the car.

*X Q 11.* Suppose you had a dozen pieces of forty feet six by six string pieces to be transported on two trucks with bolsters, would the proper distance of the bolsters from the ends of the timber be also from four feet six inches to five feet?

*Ans.* I would accommodate the trucks to the most advantageous carriage of the timber, to prevent its swagging or dipping at the ends.

*X Q 12.* Are not passenger cars framed expressly with a view to permit the trucks being placed as near the ends as you have described without their swagging in the centre?

*Ans.* Yes, we brace them to prevent the car from swagging in the centre.

*X Q 13.* Is not the proper position of the trucks of the eight-wheel car a matter of adjustment and experience, or is it a matter of indifference?

*Ans.* It is a matter of adjustment and experience, and not of indifference.

*X Q 14.* In what do you consider the improvement referred to in the testimony of Conduce Gatch, of which you have spoken in your examination in chief to consist?

*Ans.* I consider it to consist in all that is necessary to make an eight-wheel car adapted to running on railroads. I consider it to consist in two bolsters, one placed on the other with a bolster pin.

*X Q 15.* Do you consider that the invention described in the specification of Ross Winans, is the same as that mentioned in your answer to the last interrogatory?

*Ans.* Yes, as far as concerns the bolsters.

*Direct Q.* Are not the same results produced by the invention men-

tioned in Gatch's testimony as his, as are produced by Winans' specification?

*Ans.* Yes, I think they are.

J. C. A. SMITH.

### DEPOSITION OF REUBEN ALER.

REUBEN ALER, a witness for Defendant: and the said witness deposes and says as follows:

I was employed on the Baltimore and Ohio Railroad about fifteen years. I went there in 1828, and left in the early part of 1829. I went back in the latter part of 1829, and left it again, I believe, in December of 1829, and went back again on said road in March 1830, and left it again in July, 1830; went there again on the first of January, 1831, and remained in the employ of said Company from that time to 1843.

Q 1. You have heard read Mr. Conduce Gatch's testimony as to the improvement made by him and used on the Baltimore and Ohio Railroad. Did you at any time when in the service of said Company, see the principle of Mr. Gatch's alleged improvement put into practical use? and when was it, and what were the advantages resulting from it, in your opinion? Mention what they were, and how they were produced?

[The Plaintiff's counsel objects to the question.]

*Ans.* I saw in the month of July or August, 1831, the hands on the Baltimore and Ohio Railroad Company hauling logs, and they had a difficulty in loading them and how they should get them on single cars. I think the idea was first suggested by a man named Wentz; says he, "why not go and get a bolster and put on the top of them cars and make a common wagon of them at once, for they'll work as any common wagon." The bolsters were made by some of the hands in the shop, I cannot say certainly by whom, but I think a man by the name of Rupp, who was under Mr. Gatch, worked on them, and when made, the timber was loaded on the cars and found to answer the desired effect. The advantage of this arrangement of the two cars was, that it enabled the cars to traverse the curves as easily as a single four-wheel car would. I do not know of any other advantage except to adapt the cars to the curves, because on a straight road a log of any length might be carried in a single car, provided that the car was long enough.

I consider that all the advantages attained in the eight-wheel car now in general use, were attained in the application of the bolster to the common four-wheel car for the transportation of lumber. I have read the specification S. P., and the objects of the eight-wheel car as set forth in said specification were obtained in Gatch's application of the bolsters to the cars for hauling lumber. The same principles and advantages were attained in Gatch's application of the bolster, but I see by Mr. Winans' specification that he claims a patent for the mode of constructing those cars. I think the objects and advantages stated by Mr. Winans in his specification as being had in view by him were obtained by the application of Gatch of the bolsters as testified by said Gatch in his evidence.

Here the further examination of the said witness, Reuben Aler, was



postponed and adjourned over to the ninth day of June aforesaid, on which day the said witness appeared, and his examination being resumed by the Defendant's counsel, he deposed as follows :

I would like to qualify my previous testimony as to Gatch's improvement. I mean to say by Gatch's improvement, that he being superintendant of the shop, under whom the hands worked, by whom it was done, is the reason why I say Gatch's improvement, because all work done in his shop under his direction we call his work. The advantages of this principle were that it enabled them to use single cars or trucks with their wheels coupled closer together than they were in the habit of making them, and it enabled the cars to turn curves easier in hauling lumber. I had never known Gatch's improvement applied to a Railroad car before the time he did it, because the first Railroad cars I ever saw were on the Baltimore and Ohio Railroad, and I believe said road was the first road in successful operation in this country. I believe it was considered by some a matter of great importance, but I never so considered it, because I considered it as only merely applying the same principles which are in every common wagon or coach. I considered it useful as applied to railroads. The railroad was new and the cars were new in this country, and the application of the principle was as new as either of them.

I cannot recollect distinctly when I first heard that Mr. Winans claimed to be the inventor of the eight-wheel passenger cars, but I think it was some two years, from two to three years after I had seen the principle applied on the said road before I heard of Mr. Winans' claim of invention. When I heard that Mr. Winans claimed a patent for this, I observed to some one who was speaking of it, that I did not know how he could claim a patent for it, for it was as old as the oldest common wagon, and perhaps I said this had been done in hauling lumber on the road. I know Conduce Gatch, and have known him eighteen years.

*Ques. 2.* What is his character as a workman? (Question and answer objected to by Plaintiff's counsel.)

*Ans.* His character as a workman was that he was a good workman, a good millwright, and considered a good mechanic. He was in 1830 and 1831 employed on the Baltimore and Ohio Railroad as Superintendent of the carpenters and millwrights, wheelwrights and coach-makers in the construction of railroad cars. There were no car builders in this country until 1830.

And the witness, Reuben Aler, being *cross-examined* by the Plaintiff's counsel deposes and says as follows :

*X Q 1.* In carrying the lumber as you have described were the ordinary stone cars used or were trucks constructed especially for the purpose?

*Ans.* The ordinary stone cars were used.

*X Q 2.* When, to your recollection, were the first trucks built for eight-wheel cars, having the wheels placed closer together than in four-wheel cars?

*Ans.* I am not able to state the time exactly, but it was in the year 1831.

*X Q 4.(?)* For what cars were they built?

*Ans.* They were built for the car Columbus.

X Q 5. What was the distance apart of the wheels of the Columbus?

Ans. I am not able to answer this question. I had nothing to do with the construction of said car, and merely saw it in passing to and fro through the shop while the hands were at work upon it.

X Q 6. What was the distance apart of the wheels of the stone cars used in carrying lumber?

Ans. I do not recollect this distinctly; we had no rule in particular that I recollect. I worked on cars and the measurement of the wheels apart was generally given me on a rod by Mr. Gatch. The distance between the wheels varied from four and a half to five feet, as well as I recollect. In some of the passenger cars the wheels were a great deal farther apart than in others.

X Q 7. Look at the drawing A. B., and say whether, to the best of your recollection it is a true representation of the car Columbus, and if not, in what respects does it differ? state them all.

Ans. I do not think it is. It differs in the trucks; the said drawing shows the perch to run all the way through, while, to the best of my recollection, the perch only ran half way through in the Columbus. My recollection is, that the perch stopped at the bolster and was connected with a pair of hounds. The pannels of the body in said drawing appear to me to be wider than they were in the Columbus. I think the railing on top is represented differently, but I cannot say positively.

X Q 8. Do you consider what you have spoken of as Gatch's improvement, as anything more than the application of the bolsters of a common wagon, one swivelling on the other, to railroad cars, to enable them to carry long timber as you have described?

Ans. I do not consider the application to railroad cars was more than I have already stated. I have stated that it adapted itself to the curvatures of the road and enabled them to haul timber of any moderate length by the use of the bolsters swivelling one on the other. No. I do not consider Gatch's improvement as anything more than the application of the bolsters of a common wagon one swivelling on the other to enable them to carry long timber as I have described.

X Q 9. What was Gatch's occupation before and after he left the Railroad Company's service?

Ans. Said Gatch followed the millwright business, and still follows that occupation.

The *examination in chief* being resumed by the Defendant's counsel, the said witness deposes and says as follows:

3. (?) The advantages of the application of Gatch's alleged improvement, if applied to the construction of eight-wheel passenger cars are, that it enabled them to build cars much longer, which are safer and the side motion of the cars is done away with.

Of course they can apply the trucks to cars of any moderate length and of course being on two trucks, they are not so apt to tilt or have a jumping motion. Of course the distance of the wheels apart is a matter of importance, because the nearer the wheels are brought together, the easier the car runs on a curved road. I do not know that the effect of making the cars run easier by placing the wheels close together, was observed by me at the time of the use by Gatch of the application of his principle.

X Q 10. (?) Had your attention been turned to the effect spoken of in the last interrogatory, do you think that the principle so applied would or would not have developed that effect in its practical operation. (This question is objected to as a leading question.)

Ans. I certainly think it would, provided my attention had been called to it at that time.

Q 4. In your answer to the seventh cross-interrogatory, you speak of the advantages of Gatch's invention as connected with the transportation of timber, would that principle apply only to the transportation of lumber?

Ans. I do not mean to say that it is confined entirely to the transportation of timber. It may be applied to the transportation of any thing else whatever, or any kind of cars.

I wish to add in reference to the date mentioned on the first part of my examination, that I fix those dates entirely from my recollection, and that from the fact that Colonel Small went into the Railroad Company's service in April 1831, and that subsequently in June of that year, he employed me to do out-door work, and it was while I was so engaged in out-door work that lumber was transported on the railroad cars as before mentioned by me. The Columbus made her first trip on the twelfth of September, 1831, to the best of my recollection.

REUBEN ALER.

## DEPOSITION OF JAMES B. DORSEY.

ROSS WINANS vs. TROY & SCHENECTADY RAILROAD COMPANY.

Deposition of JAMES B. DORSEY, a witness for the Defendants.

That his occupation is that of a Railroad Machinist and Engineer, and he is now in the employment of the Baltimore and Ohio Railroad Company, and has been in said employment uninterruptedly for two years and a half past; that he was first in the employment of the Newcastle and Frenchtown Railroad for five years; then for between one two years he was engaged on the St. Marks and Tallahassee Railroad; and lastly, as before stated, in the employment of the Baltimore and Ohio Railroad Company.

Deponent has knowledge of the construction of railroad cars and has constructed them; he has constructed four-wheel cars and eight-wheel cars; he has knowledge of the construction of the eight-wheel passenger cars now in use on the Baltimore and Ohio Railroad, and said cars are constructed according to the specification marked (Exhibit, S. P.,) which is now shown to him, and which he reads. The eight-wheel car has advantage over the four-wheel cars. In the first place, the load will be carried more steadily, because the center of gravity or point of contact is not immediately over the wheels. The next advantage depends on the kind of road; when there are abrupt curves to overcome, it can be better accomplished by the wheels of each truck being placed closer together, and thus they adapt themselves to the curves of the road. A car of large capacity can be made to be put on them. As to the principle of eight-wheel cars, he first saw it applied in the winter of 1831 and 1832, while in the employment of the Baltimore and Ohio Railroad Company, and where it was employed in the transportation of long timber on two ordinary four-wheel cars. There

was a bolster on the platform of said cars on which the timber was laid, and the bolster so used acted on the same principle as the bolster on the fore wheels of a common road wagon.

Deponent does not know who applied said bolsters to the cars of which he has first spoken. The cars came from the depot of said road to that portion of the road where Deponent was there employed.

Deponent has constructed the eight-wheel passenger cars, and constructed them for the Newcastle and Frenchtown Railroad in 1834, to the best of his recollection. After the discovery of the log-carriage or timber carriage before spoken of, and *previous to his constructing* a car, Deponent saw an eight-wheel passenger car, which was on the Baltimore and Ohio Railroad, in the latter part of the winter of 1831 and 1832, and which was constructed at the workshop of said Company. His knowledge of the construction of the eight-wheel passenger car was not derived from Mr. Ross Winans in person, but his knowledge was derived from his own observation and seeing the cars that were constructed and used on the Baltimore and Ohio Railroad. The person who constructed the cars at Baltimore told Deponent that he had constructed them under the direction of Ross Winans. Oliver Cromwell was the man who constructed them. Gatch was a wheelwright and a general boss, or superintendent. Deponent ought to have said car, for at that early date only one car had been constructed on the Baltimore and Ohio Railroad.

When Deponent was on the Newcastle and Frenchtown Railroad he proposed to build eight-wheel cars for said road. The Directors, to whom he made the proposition, doubted the utility of them, and to convince them of the utility, Deponent constructed a rough eight-wheel car, by placing a long, rough frame on two common platform four-wheel burthen cars; he then exhibited the car to them, and received instructions to go on and build cars in a more permanent manner, for the use of merchandise. Then under directions from the Directors, he went on to construct passenger cars, and while engaged in constructing these passenger cars, Deponent visited Baltimore and examined the cars which had been constructed on the Baltimore and Ohio Railroad, and in a conversation with Mr. Winans on that occasion, he informed Deponent that he had a patent; *and Deponent went on* and constructed the cars, *regardless of his patent*, as he considered it invalid and so told Mr. Winans. The substance of his remarks was, that there had been eight-wheel cars constructed or planned in Europe. Winans said that they were not constructed for the same purpose—turning of curves—and that they did not accommodate themselves to curves. Deponent argued that the English cars were constructed on eight wheels, and that that car and those constructed here for hauling timber with the swivel principle, contained the principle of his patent or claim, presuming his patent to be for an eight-wheel car; and Deponent had seen Mr. Winans' car. At the time of his observation of the swivel principle as applied to the transportation of timber, the idea suggested to his mind of the application of this principle to an eight-wheel passenger car.

Q 2. (?) At the time of the observation you made of the application of the swivel principle in the transportation of timber, and when the advantages to be derived in its adaptation to passenger cars occurred to you, as you have already mentioned in your testimony, did you then,



or at any subsequent time, mention the utility of an eight-wheel passenger car, constructed upon the same principle, to any person, or did you remain silent as to these supposed advantages?

*Ans.* He does not know that he communicated this idea to any one; he does not recollect any person that he communicated it to. He made mention of these advantages, but to whom at this time he cannot recollect.

Deponent has read the specification of Winans' claim, marked "Exhibit S. P.," and the swivel principle which he saw in use for transportation of lumber on the Baltimore and Ohio Railroad is essentially the same as the car mentioned in said Winans' specification. The timber did pass the curves, but a closer proximity of the wheels would have better accommodated them to the curves. The proximity of the wheels did suggest itself as an advantage to Deponent's mind. There is nothing in the frame work of the body of an eight-wheel passenger car different from the body of a four-wheel car, except the attachment of the bolsters, and a necessary strengthening as you extend the body.

Deponent built the first eight-wheel passenger car for the Newcastle and Frenchtown Railroad Company in the spring of 1835, and there was no difference in the principle of the building of said car from the principle he has seen in use in the transportation of timber on the Baltimore and Ohio Railroad, and had he never seen a passenger car on Baltimore and Ohio Railroad, he would have been enabled to have constructed an eight-wheel passenger car.

The very close proximity of the wheels of which Mr. Winans speaks, had not suggested itself to Deponent's mind, and Deponent should probably have constructed the wheels of the trucks as far apart as the wheels of the ordinary four-wheel cars. At this early period, Deponent's idea was very crude, and he had not considered the details of the adaptation. At the time he constructed the eight-wheel cars, the road for which they were intended was a straight road, and it was not necessary to put the wheels close; but he placed them as far apart as his timber would permit, considering it an advantage to do so on a straight road; but at the time he built the cars in 1835, he did think that for curves of small radii, wheels close together would be better, and this opinion was founded on his knowledge of mechanics. Deponent had no knowledge of Mr. Winans' patent at the time of his (Deponent's) first construction of burthen cars for the Newcastle road.

THE TROY AND SCHENECTADY RAILROAD COMPANY *adm.* ROSS WINANS.

*Cross-interrogatories to James B. Dorsey, on the part of Ross Winans, the Plaintiff.*

1 X. Do I understand you to say that the timber car was the same in principle and mode of operation as the eight-wheel passenger car now in general use throughout the country?

1st. To the first cross-interrogatory he answers: That its principle of action on the road is the same; Deponent's modification of the four-wheel passenger car now in use makes it better adapted to the passing of curves than the rude timber car spoken of.

2 X. Was the timber car a permanent structure, all the parts of which were arranged in reference one to another?

2d. Answers that it was not, but the ordinary platform car with bolsters put on it, for the occasion of carrying timber.

3 X. Did not the application of what you call the swiveling principle to the passenger car, require care, consideration and mechanical ingenuity and contrivance?

3d. Answers that it did require care, mechanical ingenuity and contrivance to make it permanent and lasting, while the other was only temporary.

4 X. Was nothing more required than was necessary to turn a temporary contrivance into a permanent structure—in the change from the two trucks carrying timber to the present eight-wheel passenger car?

4th. Answers that there was something more required; for the accommodation of passengers is very different from the accommodation of logs.

5 X. Was anything more necessary to carry passengers than to carry logs, except covered and convenient seats in a suitable body?

5th. To the 5th he answers that there was not.

6 X. Was anything more in fact done in converting the timber car into the present eight-wheel passenger car, than to provide a cover for the passengers with suitable seats in a proper car body?

6th. Answers that there was, and for the purpose of strengthening the parts and making it better adapted to sustain the body of the passenger car than was necessary for the purposes for which the car had been built; that is, the ordinary platform car.

7 X. Were not the trucks of the timber car united by a coupling, to prevent their separating under the timber?

7th. Answers that he presumes they were, from the nature of the case.

8 X. Are the trucks of the present eight-wheel car thus united?

8th. Answers that they are not, for the reason that the bolt goes through the body, and it did not go through the timber.

9 X. Was not the power applied to the truck in the timber car?

9th. Answers that it was.

10 X. Is it so applied in the eight-wheel passenger car?

10th. Answers that in some instances it is applied to the body, and in some instances the draft is to the truck.

11 X. Is it generally applied to the body or the truck?

11th. Answers that it is generally applied to the body.

12 X. Would not the connection of the trucks of a train of passenger cars, instead of the bodies, control the free action of the trucks in swiveling, and to that extent diminish the freedom of motion of the truck in passing short curves and turnouts, which is now one of the merits of the invention?

12th. Answers that it would, to a greater or less extent, according as mechanically applied.

13 X. What position did the trucks occupy in reference to the length of the timber in the timber car?

13th. Answers that they were placed, as well as his recollection serves him, so as to take an equal amount of the loads.

14 X. Do you mean to say that one half the weight of the timber was placed on each car?

14th. Answers that he does mean to say so.

13 X. (Repeated.)

13th. Repeated. Answers that he does not recollect.

15 X. If you do not recollect the position of the trucks, in reference to the length of the timber, how do you know whether their position was suited to the purposes of an eight-wheel car, or has been imitated in the eight-wheel cars now in general use in this country?

15th. Answers that he came to his conclusion from the fact of seeing a body of timber loaded on two cars, the timber resting on bolsters, turning an abrupt curve at high speed.

[Plaintiff's Attorney repeats the question.]

Ans. The particular position of the trucks Deponent does not recollect, but from its general position Deponent comes to the conclusion that it is similar to the eight-wheel car.

[Plaintiff's Attorney repeats the question.]

The witness answers by referring to his previous answers to this question.

16 X. Is the position of the trucks under a well constructed eight-wheel passenger car, a matter of indifference, or of thought and well considered adjustment?

16th. Answers that in their present state of perfection, they are accommodated well to the purposes intended.

[Question repeated.]

Ans. It is not a matter of indifference, but a matter of thought and well considered adjustment.

17 X. Is the distance apart of the wheels of the trucks of an eight-wheel car a matter of indifference, or a matter of thought and adjustment?

17th. Answers that they are a matter of thought, and should be so constructed as to accommodate themselves best to the road over which they are to pass.

18 X. Is not then the only similarity between the eight-wheel passenger car and the timber car, of which you have spoken, the swiveling the body on the trucks, with this difference, that in the passenger car the power is generally applied to the body, while in the timber car it was applied to the trucks?

18th. Answers that there is a difference in the construction of the two cars, and their greatest similarity is that they both work on a pivot or bolster.

19 X. Did you ever see an eight-wheel passenger car before you saw the Columbus on the Baltimore and Ohio Railroad in the winter or fall of 1831?

19th. Answers that he did not.

20 X. Did you ever communicate to Ross Winans the idea of an eight-wheel passenger car prior to your seeing the Columbus, as said to have been conceived by you in your examination in chief, when you saw the first timber car?

20th. Answers that he did not.

21 X. After the idea was suggested to you as stated, did you ever make a model of an eight-wheel passenger car, or take any step to give the idea thereof to the public, prior to the building of the car in 1835, on the Newcastle and Frenchtown Railroad?

21st. Answers that he did not, further than as before stated; that he made mention of his idea to persons whom he does not now recollect, and, to the best of his recollection, he mentioned his idea at the time he first observed a load of timber on two cars, passing round abrupt curves.

22 X. Do you consider the eight-wheeled passenger car a valuable and important acquisition to railroad machinery?

22d. Answers that he does; it is highly so.

23 X. Did you not find great difficulty in inducing your employers on the Newcastle and Frenchtown Railroad in 1835 to adopt it?

23d. Answers that he did; the difficulty was in the introduction of the eight-wheel car, but not of the passenger car.

24 X. Had not the employment of two trucks to carry long timber, become common on railroads in 1832, 1833 and 1834?

24th. Answers that it had.

25 X. How long was it, to the best of your recollection, before the eight-wheel car got into general use in the United States?

25th. Answers that it was not, until the year 1838.

26 X. Did not builders and Companies with the eight-wheel car on their road, still persist in building four-wheel passenger cars?

26th. Answers (question objected to) that he does not recollect.

27 X. Did you, or did you not, advise Ross Winans that it would be impolitic to throw difficulties in the way of the eight-wheel car, because people were so incredulous in regard to it; and did he not, in the conversation of which you have spoken in your examination in chief, tell you that he wanted the invention to come before the public, when his demands would be such that no one would object to them, to the best of your recollection?

27th. Answers that he did so advise said Winans. The balance of the interrogatory the witness answers in the affirmative.

Examined in chief by the Defendants' counsel.

1st additional interrogatory by Defendant's solicitor:

In your several answers to the Plaintiff's cross-interrogatories, you speak of the adaptation of the swivel principle to the four-wheel cars as not combining all the advantages of the present eight-wheel passenger car. State whether the receipts of the alterations to enable the principle to be applied successfully in its use and adaptation to a passenger car, was known to you, and did you mean that the principle had been changed in any manner?

1st. To the 1st additional interrogatory he answers: That cars having been made previous to his constructing them, was a mode consequent on it of strengthening the cars, but such mode would have suggested itself to him, or to any other mechanic.

2d additional interrogatory by Defendant's solicitor:

Having heard read the specification of Mr. Winans' patent, marked S. P., and what he claims to be his invention, is there anything new in the description of his invention for the construction of an eight-wheel passenger car, to produce the advantages in his application, unknown to you at the time of said application for a patent?

2d. Answers that he does not.

28th additional cross-interrogatory:

Do I understand you to say that when you saw the timber car, the



eight-wheel car described in Winans' specification presented itself to your mind at once, and you could forthwith have built the car so specified, had you been employed to do so, or was not your idea crude and imperfect?

28th. To the 28th cross-interrogatory he answers: That the idea of a passenger car occurred to him that a car could be so constructed as to accommodate passengers, but not matured in all its parts, but a crude general idea of a passenger car.

(Signed,)

JAS. B. DORSEY.

### DEPOSITION OF ASA WHITNEY.

ASA WHITNEY, deposition for Defendant. I am a machinist, practically and theoretically, and have pursued that business for at least thirty years. I was in the service of the Mohawk and Hudson Railroad Company as machinist from February 1831, to the spring of 1836, and from July, 1837 to July, 1839. I was appointed Superintendent of said road early in May or April 1833, and continued so during the residue of the time I was in the service of the Company.

While I was machinist of that Company, I constructed a truck to be used under one of their locomotives; the first one I constructed was in the fall and winter of 1832 and 1833, and put in use on the 24th or some of the last days of May, 1833; the locomotive under which it was put we called the "John Bull." There was a truck in all respects similar to that under the John Bull, under a locomotive called the "Experiment," the engine and truck of this locomotive were made by the West Point Foundry Association for the Mohawk and Hudson Rail Company, and delivered to said Company the 1st of September, 1832, and put in use on said road early in September, 1832.

The Plaintiff's counsel objected to the evidence in due time relative to the truck made by the West Point Foundry Association, on the ground that no notice was given of such evidence.

The drawing marked by me "Defendants' Exhibit, No. 1, A. Taber," represents a side view of the truck and driving wheel of the locomotive Experiment, and the frame on which the engine rest, which is all that it represents connected with the truck. The "truck" we call a system of four wheels placed on two axles which are placed parallel with each other, and kept in that position by a frame work having boxes on which rests the load to be carried. That truck is kept in its relative position to the carriage resting on the truck, on which carriage is deposited the load to be moved by a centre-pin or king-bolt, otherwise called the transom bolt; the load rests on the two side pieces of the truck frames and not on the centre-pin, between which side pieces and the journals of the axle there are four springs, one for each journal of the axle. This describes the general features of the structure of the truck. This truck frame consists of two pieces running lengthwise of the truck from one axle to the other at the extremities of the axle, and may be outside or inside of the wheels, according as it has an outside or inside bearing; in this case it had an outside bearing.

These two side pieces are framed into two transverse pieces at their ends, constituting the ends of the frame; in one of these trucks there is

a piece running transversely from side to side across the centre between the two axles, and the other is made with a like piece running longitudinally from end to end of the frame at the centre between the wheels of the truck; the first above description of cross-piece was used in the truck under the Experiment and the other, that is the longitudinal one, on that under the "John Bull." The centre-pin in each of these trucks was at the intersection of lines drawn diagonally from centre to centre of the tread of the wheels; this would bring the centre-pin or bolt in the centre between the wheels of the truck and the axle of the truck. The upper end of the centre-pin or bolt was firmly fastened to the boiler of the Engine, which rested firmly on the upper frame and became a part of it.

The object of the centre-pin was to keep the carriage and load resting on it in the same relative positions laterally with the trucks. When the engine was running with the truck forward, the truck was left free to conform to the curvatures of the road by turning on the centre-pin; the lower end of the centre-pin was inserted in a socket made fast in the centre timber of the truck; the power to drive the truck resided in the engine attached to the upper carriage, consequently in moving forward the motion was communicated through the centre-pin to the truck, and the carriage was pushed forward, being driven from a power behind; in moving in the other direction the truck becomes the rear wheels, and is drawn instead of being pushed in the same manner. When the carriage is running in the last mentioned direction, the operation of the centre-pin is to enable the truck to turn the curve the same as if it was running in the other direction. In both the abovementioned engines there was a segment of a circle made of iron, attached to the upper side of the side timbers on each side of the truck; on each side of the upper frame there was what we would call a stand perhaps, made of cast-iron, which held the journals of a conical roller on each side, the load rested on these rollers which rolled back and forth as the truck run into a curve one way or the other on the segments of these circles, to prevent the rocking or promote steadiness. The truck as I have described it is composed of two pairs of wheels with the frames connecting them together. Under the engine "Experiment" the flanges of the forward and rear wheels of the truck were about twelve inches apart. I don't recollect precisely, but I see by the drawing "No. 1, A. Taber," that they are about twelve inches apart. Under the engine "John Bull," they were nearer together, not more than two or three or a few inches apart; at all events, they were nearer than in the other. I should think it would not require any inventive power to place the wheels nearer together or farther apart, *unless some new object was to be gained by it*. It would be an improvement if any means could be adopted to lessen the difficulty of passing a curve; the nearer the wheels are together the less that difficulty would be.

There is nothing new in the fact or principle that you can pass a curve more easily with the wheels near together than further apart; it has been known ever since I knew anything on the subject of railroads. In the first carriage that came out from England the wheels were as near together as they could be without touching.

The answer in the last sentence was objected to as not coming within the notice of defence in this cause.

The diameter of the wheels of the truck under the "Experiment" was thirty or thirty-two inches. The diameter of those under the "John Bull" were less; they were twenty-eight or thirty inches. The distance between the centre-pin of the truck, under the "Experiment," and the centre of the driving wheels, as appears by the abovementioned drawing, which is, I believe, correct, was eight feet eight inches.

Early in the spring and in March or April, 1832, southern pine rails for the second track were delivered on the first truck. These rails were from forty to sixty feet long. I think the longest were sixty feet at least. They were drawn on the road by the use of two common cars constructed for drawing materials. These cars were placed far enough apart so that each sustained half the burthen, and about thirty feet apart for a sixty foot stick. These cars thus laden did not exactly constitute an eight-wheel car, inasmuch as in turning a curve with cars loaded in this way, the timbers must slip on the cross timbers (on which it rested) or the cross timbers must slip on the cars; while in the eight-wheel car on two trucks, the truck traverses round the centre pin on two rollers, and the friction would be less in the latter case than in the former.

The cross timber last abovementioned was placed crosswise across the centre of each car. Before we made the trucks in the manner I have above described, we put a bolster on the cross timbers and fastened it with a centre-pin upon which we drew timber; it was a rude structure.

There was a truck similar to those under the John Bull and Experiment used under a locomotive on the Saratoga and Schenectady Railroad in June, 1833.

I passed over the road of the Defendants two years ago and noticed the cars; they were long eight-wheel cars.

They had four wheels at or near each end on two trucks. I think each four of these wheels were a truck which were similar in all essential points, and operated like those under the John Bull and Experiment.

Q 2. Could a mechanic capable of constructing a railroad car put two of these trucks under a car, one at each end, without exercising the faculty of invention?

Ans. I do not think the faculty of invention consists in repeating what has already been done, (that is, I mean invention does not consist in so repeating.) The trucks under the John Bull and Experiment were the same, except putting the two under instead of one; and to multiply by using two trucks instead of one, I do not consider invention.

Q 3. Would a good mechanic, acquainted with the principle of the running of cars upon a railroad which had curves in it, straight in some places and curved in others, know how to locate these trucks in the proper manner under a railroad car?

Ans. I think he would.

*Cross-examined.*

X Q 1. In answer to the question beginning with "could a mechanic (fol. 17) capable of constructing a railroad car," did you not say that it is difficult to tell what invention is?

Ans. Yes, I recollect saying so.

X Q 2. Did you ever see a railroad passenger car with the same arrangement of wheels taken collectively as you have described to have been used in the "John Bull" locomotive?

Ans. I have not.

X Q 3. Did you ever see a railroad passenger car with the same arrangement of wheels taken collectively that you have described to have been in the Experiment locomotive?

Ans. I have not.

X Q 4. Do you think such an arrangement of wheels would make a good passenger car?

Ans. Not as good as though there were two trucks under it.

X Q 5. When did you first see an eight-wheel passenger car with a permanent body, such (?) are now in use?

Ans. I cannot answer that question with precision, but think in the fall of 1834 or 1835, but cannot be certain.

X Q 6. Can you state where you first saw such a car?

Ans. In the fall of 1834 or 1835 I went from New York to Baltimore, and think I saw the first car of that kind on that trip.

X Q 7. Can you now state whether you travelled the entire distance by railroad, or whether you travelled a part of the way by coach or water?

Ans. I travelled from New York to Amboy by boat, then to Bordentown by railroad, thence to Newcastle by steamboat, thence to Frenchtown by railroad, thence to Baltimore by steamboat.

X Q 8. Can you state upon which [of the railroads referred to you saw the eight-wheel car referred to?

Ans. I cannot with precision, but think it was at Baltimore or Frenchtown on the Newcastle road.

X Q 9. When you say Baltimore or Frenchtown, do you mean to refer to the city of Baltimore as distinguished from the Frenchtown railroad?

Ans. Of course I do.

X Q 10. At the time you put the four-wheel truck under the John Bull, did you know or had you heard of the eight-wheel passenger car hereinbefore referred to?

Ans. I had not.

X Q 11. Up to the time that you put the four-wheel truck under the John Bull, had you any knowledge of an eight-wheel car for carrying passengers having been constructed for use on any road?

Ans. I had not.

X Q 12. Supposing that a car builder having experience in such business should have been shown the John Bull, and after having seen it been requested to build the best passenger car which his information up to that time would have enabled him to do, would he have built an eight-wheel car similar to those now in use?

Ans. I think a car builder having experience of the want of railroads, would have decided to build longer cars as all railroads now do, and in making longer cars I should suppose they would have put two trucks under them.

X Q 13. Do you mean to say that the only advantage of the trucks consists in the length of the car body?

Ans. No.



**X Q 14.** How long after the arrangement of the trucks under the John Bull was made did you continue as Superintendent of the M. and Hudson road?

*Ans.* Until the fall of 1839, except a year from May 1836 to 1837.

**X Q 15.** Can you now state when the first eight-wheel passenger cars were first put on the road?

*Ans.* They were not put on it until after I left it; the road was stocked in its early starting.

**X Q 16.** After the time you have stated at which the John Bull was arranged with the four-wheel trucks and before you left, were any passenger or freight cars procured or built by said Company?

*Ans.* They were; an additional number of cars were being built at the time of the alteration of the truck of the John Bull, and were put on in the spring and summer of 1833; there were other freight cars added afterwards.

**X Q 17.** Can you state how many were put on annually?

*Ans.* Between 1833, the commencement of the season, and the close of 1834, there were about 150 freight cars put on; this is according to my best recollection, and this number was kept good; we broke them occasionally.

**X Q 18.** Do you mean to be understood that between the close of the year 1834, and the time that you say you quit the service of the Company in 1839, that there were no new freight cars built?

*Ans.* I do not recollect of any; we may have broken cars and built others as substitutes for them, but I do not think there was an entirely new car built during that time.

**X Q 19.** Do you not know that during the period referred to, from 1834 to 1839, that more or less of the cars used for freight on that road were demolished by accidents on the road?

*Ans.* I do not recollect of a single one being demolished, the tops were broken, but the wheels, the running part, was preserved; the tops are a frailer structure.

**X Q 20.** Between 1834 and 1839 were any alterations made in the construction of the running gear of the cars referred?

*Ans.* I think not.

**X Q 21.** Were any passenger cars procured or built between the opening of the season of 1833 and the time you left in 1839?

*Ans.* Yes.

**X Q 22.** How many and when in each year?

*Ans.* There were from sixteen to twenty-four put on during the season of 1833, or it might have been in the spring of 1834, and none after that.

**X Q 23.** You have said that you were away one year between 1834 and 1839. Were you engaged that year in railroad employment?

*Ans.* I was not.

**X Q 24.** Do you know whether previous to October, 1834, there were any eight-wheel passenger cars or burthen cars built substantially like the eight-wheel passenger and burthen cars now in use, operating on any railroad in the neighborhood where the John Bull locomotive was in use?

*Ans.* I do not.

On his *re-direct* examination the witness further testified :

Q. (?) Were all the passenger cars which you have mentioned as having been put on to the road in 1833 and 1834, contracted for in the winter of 1832 and 1833?

Ans. That is my impression.

Q 4. State the reason why those cars were not longer and with the trucks under them?

Ans. There were two inclined planes on that road, one at Albany and one at Schenectady; the distance between the angle of the plane and the place of attachment of the ropes that drew the cars up the plane, was too short to admit a long car, so that the rope could be detached from it after the hind end of the car left the inclined plane. That was altered in the winter or spring of 1835 and 1836 by removing the place of attachment of the stationary power further from the head of the plane.

On his further cross-examination this witness says :

X Q 5. (?) After the alteration that you have spoken of in the inclined plane, which would permit of the use of eight-wheel passenger and freight cars, how long was it before they were introduced?

Ans. Not until after I left, and I believe not until 1840.

X Q 6. Had the Company a shop for the construction of any and what kind of cars?

Ans. They had a shop to make their repairs and build their freight cars.

X Q 7. In your direct re-examination you have stated that the angle of the inclined plane would prevent the use of eight-wheel cars, and that during the years 1833 and 1834 there were 150 freight cars built in the Company's shops; do you mean to be understood as saying that the cars which were built were put on four wheels because the angle that you have spoken of would not permit of the use of eight-wheel cars?

Ans. I do not know that that was the only reason; for the business that these cars were used; four-wheel cars were as convenient as eight-wheel cars. There was no particular motive for change.

X Q 8. Was the motive that you refer to discussed as a motive to your knowledge?

Ans. When the cars were originally constructed it was not, because that was previous to the time of building these trucks, but subsequently and prior to the altering of the planes, that subject was discussed, and it was the motive for altering the plane that the long cars would come into use?

X Q 9. Was that subject discussed before you had seen or heard of an eight-wheel car?

Ans. I do not think it was.

X Q 10. Was not more or less of the four-wheel burthen cars you allude to, built after the John Bull was put on the road?

Ans. Yes.

(Signed,)

A. WHITNEY.

## DEPOSITION OF JOHN B. JERVIS.

ROSS WINANS *Piff.* vs. THE SCHENECTADY AND TROY RAILROAD COMPANY *Defts.*

And the said JOHN B. JERVIS having been by me first cautioned and sworn to testify to the truth, the whole truth, and nothing but the truth, in the matter of controversy aforesaid, I did carefully examine the said John B. Jervis, and he did thereupon depose, testify, and say as follows, viz.: That he resides in the city of New York; that he is going out of the United States to England, and intends to leave about the first of May; that he is a Civil Engineer by profession, and has been engaged in that business about thirty years, and has been engaged during that time on Canals, Railroads and Water Works, and was engaged in railroads from 1828 to 1833, and from 1845 to the present time. I have been engaged almost exclusively in the construction of railroads. From 1828 to 1833, I was engaged in the Carbondale Railroad, the Mohawk and Hudson, the Schenectady and Saratoga Railroads, and since 1845 in the Erie and the Hudson River Railroads. I was Chief Engineer of the Carbondale, also of the Mohawk and Hudson, and Schenectady and Saratoga Railroads; they were run a few months before I left, and the Mohawk and Hudson over a year before my connection with it ceased; all the machinery, locomotives and cars were constructed under my direction previous to my leaving them. I was Chief Engineer of the Hudson River Railroad for about two years and a half, and since have been Consulting Engineer. I had charge of all the preliminary examinations of the Hudson River Railroad since 1845. I have paid a great deal attention, since I have been connected with railroads, to the construction of locomotives and cars. I have a good deal of knowledge of the principles upon which the running part of locomotives and cars which are now used and which have been in use since I have been engaged in my profession, have been constructed and used. My attention has been particularly directed to the subject of the arrangement of the wheels of locomotives and cars to facilitate the running of locomotives and cars on curves; my attention was very early directed to that subject. It was a subject on which I had often thought a good deal, but made no experiments until 1831. In 1831 and early in 1832, I was very much engaged in devising some means by which four wheels could be substituted for two as the leading wheels of the locomotive, and finally prepared a plan by which the forward end of a locomotive was supported by a sort of independent carriage consisting of four wheels. Those wheels were placed near to each other and working under the main frame of the engine which rested mainly on the outside timber on friction rollers, supported in its lateral position on the frame of the independent carriage by a centre pin, and this independent carriage being a substitute for the two wheels formerly used. The paper which is now produced and marked Exhibit A G W M is a copy of the original plan of which I have spoken. I have compared it with the original plan and find it to be a correct copy; the Exhibit is annexed to this deposition. A locomotive was made on that plan under my direction by the West Point Foundry Association in 1832. I think it was called the Experiment. The locomotive was put on the Mohawk and Hudson Railroad in the autumn of 1832.

The engine was run for a sufficient time to test the independent carriage. The boiler was arranged to burn coal, but as it did not operate well, the engine was taken off. I then made a new plan for an engine for the Schenectady and Saratoga Railroad Company, with the same arrangement for the independent carriage or truck with four wheels to support the forward part of the engine. This engine differed from the first by having the boiler constructed to burn wood; the engine was constructed on this plan and put on the Schenectady and Saratoga Railroad, I think, in June, 1833. It worked with complete success. It was called the David Crockett, I think. The independent carriage or truck under the two engines spoken of were made substantially according to the plan represented on Exhibit A. I do not recollect any difference; if there was any, it was of some trifling nature. Exhibit A represents the plan on which the independent carriages of both engines were made. The Mohawk and Hudson Railroad Company had a locomotive called the John Bull; this engine was placed on four wheels, and in that way ran nearly the whole of the year 1832; in the winter of 1832 and '33, the forward wheels were taken out and four wheels on an independent carriage similar to that in Exhibit A were put under the forward end of the locomotive as a substitute for the two wheels; after this alteration she was put on the road early in the season of 1833, I think May or June, and has been run with this independent carriage ever since. Exhibit A represents a side view of the truck, with a general view of the engine. The truck had two axles placed four feet apart; that distance might be varied so as to make the distance between the axles from three to four feet, and the axles were parallel with each other in a rigid frame, and kept in that position by a timber frame composed of side and cross pieces, provided with ordinary seats and journals. This frame bore the car or weight to be carried. The independent carriage is sometimes called the bearing carriage, but more generally the truck; that is kept in its proper position by a centre-pin, by which the independent carriage is free to swivel or turn in passing curves. The centre-pin or bolt is secured to the upper frame of the car, and passes into a socket in the frame of the independent carriage or truck; this socket or hole is placed exactly in the centre of the independent carriage. The car or weight carried by the independent carriage rests mainly upon side timbers of the independent carriage which have friction rollers on the centre of them. There are steel springs that take the bearing of the weight at all the journals. The side timbers of the truck which run lengthwise, can be placed on the outside or inside of the wheels according as you have outside or inside bearings; the side timbers and cross timbers are framed together. There must be timbers in the centre running across the frame from side to side, or end to end; they are usually run from side to side; my impression is, that the timbers in the Experiment were from side to side; the socket that receives the centre pin is in those cross timbers. The friction roller rolled on a surface of iron on the bearing carriage.

The power to move the truck backwards or forward was communicated through the centre-pin. There were several objects that were designed to be secured by this independent carriage or truck; one was, the number of wheels being increased, the load remaining the same, there was greater safety and less severity on the road; another, it



allowed the frame of the engine to be supported near the ends, without any objection arising to that arrangement, which would exist if the main carriage rested on four wheels, two at each end. Another reason, which is partly incorporated in the last, that it carried the whole machinery more steady than could be done by the old arrangement, giving, as a combined action, a long frame, at the same time securing the best possible arrangement for turning curves, and by increasing the wheels without increasing the load, giving greater security against accident, and greater ease in its action upon the road. The wheels and axles as adjusted in my truck, enabled the body carried to run more smoothly and safely on the road, than it could be made to run upon wheels in the old manner of four-wheel cars as formerly constructed, and this most particularly on the curves of the road.

The two wheels on either side of the truck constructed by me, from their proximity in carrying the car, acted like a single wheel, and attained the advantage which results from having the two axles of a four-wheel car near each end of the car, while its inconveniences were avoided.

I have read the printed specification connected with Mr. Winans' patent, and have examined the drawing annexed to the printed specification. The bearing carriage, which is described in the specification and exhibited by the drawing, is substantially the same as the bearing carriages I used under the locomotives I have spoken of. It is the same in respect to all the substantial principles of construction which were adopted by me in the construction of my bearing carriage. The variance, if any, does not affect the principle of the construction.

I have examined the specification and drawing with care, and in my opinion the placing of two of the trucks described in Mr. Winans' specification under a car, is nothing more than duplicating my truck. The influence of the arrangement of placing wheels together or far apart in a four-wheel car, in regard to steadiness of action or facility in turning curves, was well understood before the adoption of the trucks in 1832.

The weight of the body to be carried on my truck could be placed by the constructor principally on either the centre of the truck or side of the truck. All the cars which I have observed having two trucks with four wheels each, have had trucks constructed on the same principle as I constructed my trucks.

The specification and drawing describing Winans' patent, are annexed and marked Exhibit, B G H M, and referred to by the witness.

JOHN B. JERVIS.

Read to and subscribed by the witness, John B. Jervis, on his examination before me, this sixth day of March, 1850.

GEO. W. MORTON, *U. S. Com'r.*

## DEPOSITION OF ELIJAH P. WILLIAMS.

ELIJAH P. WILLIAMS was then called by Defendants as a witness and testified as follows :

I was acquainted with the locomotive engines on the Mohawk and Hudson Railroad in 1832. John B. Jervis was then Chief Engineer. The Experiment was on the road at that time, also the John Bull. I think the John Bull was on first. The Experiment was constructed with a four-wheel bearing truck under the fore end, and a pair of driving wheels on the hind end. The tread of the truck wheels must have been twelve or fifteen inches apart. The truck vibrated with a swivel motion, with a bolster and centre-pin. When the John Bull came out from England, she was constructed as a four-wheel driving carriage. The trucks of the Experiment were built at West Point; her running gear worked well; there was some defect in her; she began to run early in 1832. The John Bull was imported in 1831; the truck was first under her in the winter of 1832-3; the truck was made at the head of the inclined plane near Schenectady; she was put at work on the road early in the spring of 1833. The Davy Crockett, with a similar truck, was put on the Saratoga and Schenectady Railroad in the summer of 1833. That was an English engine, and the trucks were made to order in England; it was like the other trucks. Those trucks and others like them, are still in use on those railroads. The trucks are substantially like those described in Mr. Jervis' deposition, and which were made by him in 1832. I have been engaged on railroads since 1829, and am now Superintendent of the Auburn and Syracuse Railroad, and have been since 1840. I am acquainted with the locomotives and cars in use on the railroads between Buffalo and Troy and Albany. I was acquainted with the Mohawk and Hudson Railroad while it was being constructed. I saw cars used on this road for hauling timber in 1832. Some of those cars were constructed with two rubble cars which had inside bearings and a frame about twelve feet long, consisting of side pieces and a cross timber at each end; the end pieces formed the upper bolsters. It was drawn by the truck frame. An eight-wheel car resting on a centre-pin could not be run with safety on our road at the speed we now run, without side bearings, which should be placed at the ends of the bolsters. The side bearings in use are various: Elastic Springs, India Rubber, Friction Rollers, and Sliding Bearings. In 1843 and in 1844, there were some eight-wheel passenger cars on the Auburn and Rochester Railroad, made in Cambridge, Massachusetts, which had no side bearings. They did not operate well until they were altered and furnished with side bearings. Those cars rocked when in motion, so as to make them disagreeable, as was supposed, and dangerous to passengers to travel in them, which defect was remedied by furnishing them with side bearings.

On *cross-examination* the witness testified as follows: The inclined planes on the Mohawk and Hudson Railroad were dispensed with in 1845. I think twelve or fifteen four-wheel cars passed in a train on that road, four or five of which were taken up and down the inclined plane at a time; the short cars were in three apartments, each of the apartments were five feet eight inches in the clear; the ends of the

cars projected nine inches each ; the cars were connected at first very close, and afterwards by links. The spiral spring connection was used from about the year 1840, until the short cars were discontinued. I think it is not yet agreed what is the best method of connecting cars in a train. We use India rubber springs and elliptic springs over the journals. India rubber springs over journals are best. Cars cannot be used with safety without side bearings. Smooth even plates make good side bearings. I don't think the contact of the bolsters for a foot or more each side of the king-bolt a sufficient bearing ; bearings at the ends of the bolsters are safest and best.

I think the timber cars on the Mohawk and Hudson Railroad had wheels thirty-six inches in diameter ; some had platforms ; the axles were about five feet apart ; the cars were about twelve feet long. We made use of old dirt and stone cars. The cars were connected by a frame at the centres of the body of the rubble cars ; the frame extended to the bolster. I am not able to say whether the end of the frame which constituted the upper bolster, rested its whole length on the lower bolster or not. The curves on the Mohawk and Hudson road were large curves, but the switch could not have been passed without the swivel arrangement. Trucks with axles five feet apart are now preferred to those nearer ; there is not so much concussion. I think the elevation of the outer rail on curves is of no benefit ; we dispense with it on our road, although it is the general practice on roads of short curves to elevate the outer rail ; the extent of elevation is three inches ; when the outer rail is raised, the line of gravitation is inside of the king-bolt. The bearing shown by the Plaintiff's drawing would do at twenty miles an hour.

From Plaintiff's drawing I should doubt whether it was intended to represent side bearings or not ; eight-wheeled cars are used on the road of which I am Superintendent. I am a stockholder in that road.

#### DEPOSITION OF ISAAC ADAMS.

ISAAC ADAMS was called as a witness by the Defendants, and testified as follows : I reside in Boston ; my profession and occupation is that of a machinist. I have pursued that occupation about twenty-five years. I am practically and theoretically acquainted with machinery and with the science of mechanics generally. I have carefully examined the Plaintiff's specification. I have examined the specification of Chapman's patent in the "Twenty-fourth Volume of the Repertory of Arts, Manufactories, and Agriculture, Second Series, printed in London in the year 1814," and the plates of drawings therein. It describes a truck substantially like the Plaintiff's ; it embraces all the principles contained in Winans' specification, and it also represents side bearings, viz., friction rollers, which are not found in Winans' specification. The specification and drawing of Chapman's patent describe and represent two trucks connected with a carriage or body, and embracing all the principles or mechanical contrivance in Winans' specification ; although the drawing or figure represents but one truck of four wheels, and another single pair of fixed wheels, it describes the method of substituting another truck of four wheels for the pair of fixed wheels, so

that the whole eight wheels will arrange themselves to curves when necessary to be used on curved roads. I have also examined the description in "Wood's Practical Treatise on Railroads, printed in London in the year 1825," and the plates referred to in the description, (to be found at pages 154-157, and the plate between pages 294 and 295); it describes and represents an eight-wheel carriage running on two pair of wheel trucks, with a swiveling or king-bolt connection. The principles of a carriage built according to Winans' specification are all developed in the description and drawing in Wood's treatise, though the manner of applying the motive power is different from Winans'.

The wheels in this drawing are driven by cogs. In the drawing in the "Repertory," they are drawn by a long chain running along the road and wound around a barrel.

The drawing and description show precisely how a long carriage with eight wheels, arranged to turn curves, can be constructed. I was present when Mr. Asa Whitney was examined, and heard his description of the trucks for the locomotive called the Experiment and also of the John Bull. So far as the principle or mode of action is developed, those trucks contained all that Winans claims in his specification, and in addition thereto certain side bearings, viz: friction rollers. If you would make a long carriage with two such trucks, all that would be necessary would be to duplicate the trucks, which would require no invention.

[A model intended to represent the bolsters in Plaintiff's drawing was shown to the witness.]

I think the model is a fair representation of the two bolsters shown in Plaintiff's drawing. I am of opinion a car made in that way would not be safe at the present rate of speed. I think to make it safe there should be side bearings, and the bolsters be so connected that they could not separate. I think the drawing of the car Columbus embodies the invention described in Winans' specification. I am acquainted with the eight-wheel cars in use on other roads. The main principles developed in eight-wheel cars now in use, are substantially the same as in the drawing of the Columbus, I mean exclusive of bearings and mode of attachment of the cars to the motive power and to other cars. I heard Mr. Williams testify respecting the timber cars used on the Mohawk and Hudson Railroad in 1832. I understood him to say that two trucks of four wheels each, were placed under a frame which was connected with trucks by a king-bolt. I think all the principles of the arrangement of the eight wheels and connection with the car body, are developed in the timber cars described by Mr. Williams.

The witness on *cross-examination*, testified as follows:

I am not a railroad engineer. I have been engaged in constructing portions of cars and locomotives; the mode of connection in the specification in which I include the drawing and that of the Columbus differ. In the drawing of the Columbus, the point of traction is by the truck, in Plaintiff's specification from the car body; the connection of the motive power to the truck would modify its action. Proportionally the trucks are farther apart, and the wheels are nearer together in the drawing attached to Plaintiff's patent, than in the drawing of the Columbus. In the timber cars described by Mr. Winans, I understand that the motive power was attached to the trucks.



I can discover no new mechanical action in duplicating the trucks and connecting them to four and eight-wheel carriages. When the first truck comes on a curve, the body turns on the second truck. The body does not turn on the driving wheels of a locomotive; when the first truck strikes the curve it changes its direction by swiveling. At that time the hinder truck keeps on the straight truck, and the body swivels on it. If, by an addition, a new principle or new mode of action is developed, there may be invention. I think the description to which I have been referred in Wood's treatise, does not describe side bearings. In Plaintiff's specification nothing is said of side-bearings, and none are indicated. I think the machine described in Wood's treatise was a good one in reference to the time when it was got up, although I would not construct such an one. The free play of the trucks in the locomotive described by Wood would be retarded by the action of the cogs. I see nothing in Chapman's specification of a near arrangement of the wheels and a distant arrangement of the trucks. His wheels are all equidistant from each other.

On *re-direct* examination, the witness testified as follows :

I think any person qualified to construct railroad trucks would know that by placing the wheels of a truck near together, the truck would more readily turn curves. I could not tell the exact distance [that would be best, but think the placing the wheels on the four corners of a square would be the best arrangement. When I say that I would not now construct such a machine as is represented in Wood's treatise, I mean I would leave off the cog-wheels, and substitute a steam engine of the present construction, or nearly so. But the trucks and connection might be retained, and a pair of driving wheels put between them. I should make no alteration in the principle of the truck or its connection with the locomotive carriage. Or one truck might be left off, and a pair of driving wheels substituted. In my direct examination I mean to say that the invention claimed by the Plaintiff is embodied in the drawing of the Columbus, and in coming to this result I took the drawing into consideration and examined it in common with the specification, but I did not consider the mode of attachment as part of the claim, and I consider the drawing of the Columbus as embracing all in the claim. I cannot tell from the drawing why the Columbus failed. The plan looks as if there were no side-bearings. If turning curves were alone to be considered, I would attach the motive power to the trucks; but the objection in a train of cars would be the strain on the king-bolt of the forward cars. The wheels in Chapman's engine are all driving wheels. The principle of the machine described and represented in Wood's treatise, is not affected by the character of the motive power; the principle is the same whether cog-wheels, horses or steam is the power.

#### DEPOSITION OF EDWARD S. RENWICK.

EDWARD S. RENWICK, a witness called by the Defendants, testified as follows :

I reside in the city of Washington. I am agent in soliciting patents for inventors. I am acquainted with mechanics, practically and theo-

retically, and with the construction of many kinds of machinery, and have been for above ten years, and was educated for those purposes. I am acquainted with civil engineering. I have examined the specifications and drawing of Chapman's patent, in the 24th volume of the Repertory of Arts, published in London in 1814, and am acquainted with the Plaintiff's specification. The eight-wheel carriage described in Chapman's specification and drawing embraces all that the Plaintiff claims in his patent. I have also examined the description and drawing of the eight-wheel carriage in Wood's treatise, as there shown in connection with the motive power and running gear. It contains all that is claimed by the Plaintiff in his specification.

I have heard read the deposition of John B. Jervis, describing the truck constructed by him for the locomotive "Experiment," and have also heard read Mr. Asa Whitney's deposition in relation to the same and similar trucks.

Those trucks contain every thing described in the Plaintiff's specification in the construction of the four-wheel truck. It would require no invention to place two such trucks at each end of a locomotive or car, any more than it would, after having a shoe made for one foot, to make another shoe for the other foot. Such a timber car as Mr. Williams describes, I think contains all the arrangement and connection claimed by the Plaintiff on his patent. The drawing of the Columbus contains the whole arrangement and connection of the eight wheels to the car body claimed in the Plaintiff's patent.

In examining the Plaintiff's specification, I took in connection all parts of the drawing relating to the parts claimed in Plaintiff's specification as his invention. I consider every thing in the drawing as tending to illustrate and explain the invention. But many things are shown in the drawing which are not claimed by the Plaintiff as his invention. The brake, mode of attachment, locks and fastenings, although represented in the drawing, are not mentioned in the specification, and I consider make no part of his invention. I am acquainted with the eight-wheel cars now in use on various railroads.

I think an eight-wheel car constructed without side-bearings would not be safe to run at the rate of speed now usual. Some persons might think it safe to go down Niagara Falls, but I should not.

The bolsters, as represented in Plaintiff's drawing and illustrated in the small model, [shown to the witness] would not be safe without side bearings.

The witness, being *cross-examined*, testified as follows:

It is, I think, obvious that side bearings are necessary to prevent swaying. If bolsters came in contact for half the distance between king-bolt and ends, it would not be safe to dispense with bearings in turning curves at a speed of twenty miles an hour. I have seen no cars in use without sway bearings. The distance of the bearings from the centre would be an obvious thing to a good mechanic. It is an advantage to allow the wheels to adapt themselves to slight irregularities in the road. I can't say whether I ever saw the body of a car carried off of its running gear by its centrifugal force. I have been a Solicitor of Patents fifteen months; I have engineered on railroads, but have not been a Railroad Engineer. I have had half a mile of railroad under my charge at the Wyoming Iron Works in Pennsylvania. We had eight-

wheeled burthen cars, but no eight-wheeled passenger cars. I consider it an invention to turn a shoe into a boot, because it won't require tying, and will protect the leg.

#### DEPOSITION OF WM. F. HUDSON.

WILLIAM F. HUDSON, a witness called by the Defendants, testified as follows :

I reside at Buffalo; am Superintendent of the motive power on the Buffalo and Attica Railroad; I have been there a year; I was for nine years personally engaged in constructing locomotives at Auburn; I am a machinist; I have examined Chapman's specification and drawing in the 24th volume of last series in the Repertory of Arts, &c. I have also examined the specification of Plaintiff's patent and the drawing; I think Chapman's specification contains all the arrangement and connection of the eight wheels with the body claimed in the Plaintiff's patent. I have examined the description and drawing of the eight-wheel locomotive carriage contained in Wood's treatise. That contains all the arrangement and mode of connection of the eight wheels with the car body claimed by the Plaintiff. I heard Mr. Williams testify, and heard his description of the timber cars used on the Mohawk and Hudson Railroad. That car contained all that is claimed in the Plaintiff's specification. A long eight-wheel car would not be safe for passengers without side bearings at the end of the bolsters, or some other adequate device, to prevent the car swaying. The drawing of the Columbus delineates all that is claimed by the Plaintiff in his specification as his invention; and the drawing of the Columbus represents all that is essential in the cars now in use on the railroads, except the springs and side bearings and the manner of attaching the car to the tractile power and to other cars in the train. In examining Mr. Winans' specification, I took into consideration the drawing now attached to the printed copy shown to me, (which is admitted to be correct). There are portions of the drawing that do not represent any part of the things claimed by the Plaintiff, such as the springs, brakes and other things. I find the parts as claimed in the specification all in the drawing. Nothing is said in the specification respecting the mode of attachment, nor is there any mention or indication of side bearings in the specification or the drawing.

I think it is represented by the drawing that the centre-pin alone was intended to control the oscillation of the car. The end iron I think confirms this.

Being cross-examined, the witness testified as follows: The Railroad Company in which I am employed uses the eight-wheel cars, and pays me for my services.

#### DEPOSITION OF HARVEY WATERS.

HARVEY WATERS, a witness called by the Defendants, testified as follows :

I reside in Birmingham, Connecticut, eight or nine miles from New

Haven. I am a machinist; am acquainted with the science of mechanics, have followed the business since I was seventeen years old. I have examined the description of Chapman's eight-wheel locomotive carriage in the 24th volume of the Repertory of Arts, last series, (the same spoken of by the other witness.) I have examined the Plaintiff's specification. I think Chapman's eight-wheel carriage, as described in the Repertory of Arts, contains all the principles and subject matter of the Plaintiff's specification. I have also examined the locomotive carriage described in Wood's treatise, and that I think contains the subject matter of Plaintiff's patent. I heard Williams testify, and his description of timber carriage used in 1832; that also contained the invention claimed in Winans' patent. I heard the deposition of Mr. Asa Whitney and his description of the single trucks under the locomotives.

I think it a nice question whether the one truck contains the whole of Winans' invention. I incline to the opinion that it does contain the whole subject matter.

*The Defendants rested*, and the Plaintiff gave the following testimony in reply :

#### DEPOSITION OF MICHAEL M. GLENN.

MICHAEL M. GLENN recalled, testified as follows : I find in Plaintiff's drawing a sufficient representation of a bearing surface to prevent the sway of the cars. I have seen a great many cars with the bolsters as represented in the drawing, 500 or 600. I deem it important that motive power should be attached to the body in order that it may have free motion on the curves; the extent of the bearing of the bolster as the cars were built, was eight or ten inches from the centre on each side; the cars I speak of were freight cars; some passenger cars were constructed like this, and some different. The Washington cars were made with friction rollers on the end of the bolsters. The play between the bolsters was three-eighths of an inch; the drawing represents a burthen car. I think a friction roller is a common device. I never heard Mr. Gatch lay claim to the invention of an eight-wheel car. Mr. Winans' claim to the invention was a matter of notoriety about the shops.

On *cross-examination*, the witness testified as follows : I cannot tell the extent of bearing shown in the Plaintiff's drawing. The cars I spoke of were built with bearings as shown in that drawing. There was in them eight to ten inches bearing on each side of the centre. There were 300 or 400 cars like that built before I left the road. I left the road in 1840 or 1841. The Washington cars had friction rollers. I don't know whether the Columbus, Winchester, Comet and Dromedary had friction rollers. Those four cars were on the road more or less until the Washington cars were built.

On *re-examination* by Plaintiff the witness added, that although those cars were running, they were not considered successful; the Company did not like them.



## DEPOSITION OF WASHINGTON O. FROST.

WASHINGTON O. FROST, recalled by Plaintiff, testified as follows: The drawing of Plaintiff represents a freight car. I have seen cars on the Baltimore and Ohio Railroad built in accordance with the drawing. I believe they were successful; they used them, do still some; the bolsters had a bearing from the centre-pin, eleven inches on each side. I never heard Conduce Gatch claim the invention; it was generally said Winans was the inventor.

The witness being *cross-examined*, testified as follows: I think the drawing represents the extent of bearing to be about sixteen inches each side of the centre; the upper bolster is represented to be about eight inches longer than the lower bolster. I left the Baltimore and Ohio road in 1833; I saw an eight-wheel freight car running on the road before I left; the car was employed in carrying freight on the road. The car was constructed something like the Columbus. I think the wheels were nearer together than those of the Columbus. The Columbus run a few trips before I left the road. I went back the next year on a visit and saw an eight-wheel car running on the road.

## DEPOSITION OF WILLIAM H. HIBBARD.

WILLIAM H. HIBBARD, called by the Plaintiff, testified as follows: I reside in Boston; my present business is that of Mechanical Engineer; I have from my youth followed mechanical pursuits; was for eight or nine years a draftsman in an engine shop in Boston; have paid some attention to the construction of railroad machinery; I understand the laws of mechanics and the laws of mechanical action; I have examined a printed copy of Plaintiff's specification. In all inventions some purpose is to be accomplished. The object stated in this specification is to acquire stability and diminish the friction which arises from the rubbing of the flanges against the rail, and the cause of this is, that in turning curves the axles do not coincide with the radii of the curve, consequently the flanges act obliquely upon the road. The nearer the axles are to each other the less will be the angle which the flanges make with the rail, but if the load were placed on two axles very near together, it would want stability.

That difficulty is avoided by placing a truck at each end of a long body, thus combining both advantages of near and distant arrangement of the wheels; and the trucks are left at liberty to conform to the curves of the rail as far as is consistent with supporting the body. This is effected by the swiveling motion; the active agent in producing the swiveling motion is the rails of the road.

I think it appears from the end view in Plaintiff's drawing, that the coupling the cars in a train or to the motive power, is by a bolt at the end of the platform. I conceive it necessary to the free action of the truck that the connection should not be with the truck. When the old four-wheel car passed over an obstruction of half an inch, it would raise the end of the body one inch. In the eight-wheel car the bearing between the axles would be raised but one-fourth of an inch, in the for-

mer the middle of the car would be raised a quarter of an inch, and in the latter an eighth of an inch; in the old car, the end would be depressed; in the eight-wheeled car it would not be affected; connecting cars by the truck would have a tendency to cause the truck to swerve from the direction of the rails, to the amount that it is drawn out of the direction in which the track tends to make it run. When the rear truck of the forward car enters the curve it carries the point of connection with the next car towards the outer rail, which has a tendency to throw the first wheels of the forward truck of the next car against the outer rail, and give them a diagonal action. It has the same effect on the rear wheels of the rear truck of the forward car; when the bodies are linked together instead of the trucks the tendency would be to press the whole truck, both fore and hind wheels, against the outer rail. When the attachment is to the body, it leaves the truck free to adapt itself to the curve.

The drawing of the Columbus differs from that of the Plaintiff in the attachment of the trucks to the motive power; the wheels of the trucks are not proportionally as near, nor the trucks as far apart as in Plaintiff's drawing. There is a perch to which the motive power is attached and draws by the trucks; the principle developed in the plan of the Columbus is inferior to that described in Plaintiff's patent and represented in the drawing.

[A model of Morris' car was shown to the witness.]

The Morris car has some points of resemblance to Plaintiff's; it has eight wheels; it has a provision for surmounting vertical curves, but none for turning lateral curves. I consider the difference between Morris' and Winans' cars important and substantial. I think it would require invention to adapt Morris' cars to passing lateral curves.

[A model of a timber car being shown,] the witness says: In the use of the timber car made up of two platform cars, with bolsters on them and connected by a perch below, in turning a curve the ends of the timbers must slip; the reason is, that the chord of the curve is shorter than the arc. I consider two platform cars so arranged to carry timber as a fortuitous, accidental contrivance, and not an organized machine as a whole. If, instead of the timber, a body of a car should be placed on them, the trucks being coupled together by a perch, one of the timbers would have to slide under the body at every curve. If the perch were removed, and the motive power were applied to the truck, it would resemble the Columbus in that respect.

[The drawing of the carriage of the Experiment, by M. Jarvis, being shown to him,] he says:

I do not find in this drawing the whole principle contained in Winans' specification and drawing. I find what is similar to one of the trucks described in Plaintiff's patent; that is, a truck of four-wheels with a provision for turning curves, except that the wheels are further apart.

The witness was then asked whether Jarvis' plan would suggest the plan of Plaintiff's eight-wheel car, to which he answered: I can hardly answer that question; it would depend upon the mind of the person to whom the plan was shown. I consider the difference between that and Ross Winans' patent, as substantial and important, and one which requires invention. The driving wheels at the hind end, as combined in

the carriage of the Experiment, would not have the same mechanical action as the two trucks in Winans' patent.

It is an object to get weight on the driving wheels and get adhesion. The adhesion of the driving wheels on the rail will resist the action of the forward truck in passing into a curve to the amount of that adhesion; when the truck of the locomotive passes on the curve, one or the other of the driving wheels must slip on the rails. If in the locomotive, instead of the two driving wheels, you had a pair of running wheels without any adaptation of them to turn the curves, the mechanical action of such running wheels would be the same as that of the driving wheels, though less in degree; there would be difference in the adhesion of the wheels to the rails. The driving wheels of locomotives are generally larger than the running wheels.

I have read the specification of "Chapman's Patent in the 24th volume of the Repertory of Arts;" this patent was for a machine for the purpose of drawing coal wagons on tram roads near coal mines. It describes several plans. The tram roads were made with flat bars with a ledge or flanch on the edge; the wheels were without flanches, and ran within the ledges of the road, and could run on common roads. The engine was drawn by a chain which wound round a drum and was stretched along the road resting upon forks in the centre of the truck, and by the revolution of the drum or barrel, the chain was wound up and the locomotive driven.

Those tram roads were frail and were often broken by the weight of the engine, which Mr. Chapman designed to prevent by the use of six and eight wheels so as to divide the weight. When six wheels were used, the truck was placed under one end of the engine and two rigid wheels at the other end; it speaks also of using, when necessary, two trucks of four wheels each.

There is in Chapman's specification, nothing about dividing the weight in running carriages. The object of the patent seems to have been to provide a locomotive with the motive power described. There is no drawing in Chapman's patent which represents the application of eight wheels. The drawing shows six wheels. The pair of wheels with a fixed axle are forward of the truck in Chapman's. I do not find in Chapman's description, a forward truck as a means of adaptation to the road. Taking the whole of Chapman's specification and drawing, I find Chapman's engine very different from Winans' invention. It was devised for a different purpose entirely. The principal object in Chapman's engine was to distribute the weight, and, as an incident, to allow the six wheels to conform to the curves. The drawing does not show the principle of adaptation to the curve by a forward truck. I find in Chapman's nothing of the reasoning that is found in Winans' specification. There is nothing in Chapman's that looks to bringing the axles near to each other and the trucks far apart. The opposite seems to be the idea, viz: to distribute the weight.

I regard Winans' invention as substantially different from Chapman's. Chapman's patent has no reference to running carriages. Taking Chapman's entire description and drawing, in my judgment, a locomotive to be impelled as therein described, could not be made practically useful. It would be utterly incapable of meeting the wants of a railroad now.

The specification bears date December, 1812.

I have read in Wood's treatise (now handed to witness) on railroads, printed in 1825, a description of a locomotive engine with eight wheels, and a drawing. The driving wheels are all moved by cogs; there is provision for turning lateral curves; 'The locomotive is sustained on two trucks. The driving wheels of each truck are geared together with cog wheels, and the front axle of the rear truck and the rear axle of the front truck are geared together by an intermediate cog. This intermediate cog will have a tendency to restrain considerably the free play of the trucks—to raise one end of one truck and depress the other end of the other. If the whole power of the engine is applied to turn the centre cog wheel, mashing into the cogs of the nearest axles of the trucks, it would not be practicable to connect the trucks with the body merely by king-bolts; it would be a failure on the face of it. I think it would be difficult to keep it on the track at all. I think it would be lifted and set outside of the rail. I think the gearing would not act perfectly with the swiveling principle; one or the other must be subordinate. The principle of a free swiveling is directly opposite to what is required for cog gearing. In the engine in Wood, the trucks must be near together, because you cannot have an intermediate cog beyond a certain size. I find no intimation in the description of the engine in Wood, that it is to be used for a running carriage.

I find in the engine in Wood and on Winans' car, eight wheels arranged on two trucks, and the two trucks attached to the frame by swiveling joints. Mr. Winans' car differs from the engine in having a near arrangement of the axles of each truck, and a remote coupling of the two trucks, and in drawing by the body instead of the trucks. In the engine the wheels propel the carriage, and in Winans' the carriage propels the wheels. In the engine the wheels are primary; in Winan's they are subordinate. In the engine part of the load is put on the trucks and part on the bolsters; in Winans' all the load is on the bolsters. In the engine the bolsters must be high, so that the cogs may not interfere with the king-bolts; higher than Winan's car.

On *cross-examination* the witness testified as follows:—

Winans' specification directs the wheels of each truck to be placed as near together as convenient, but does not state at what distance apart the two trucks should be placed. The direction is to place them near the ends of the car far apart, a considerable distance apart. He also states that in form the bearing carriages may be beyond the end of the car. The mode of connection is by a bolster like that of a wagon and king-bolt. There is nothing else claimed in Winans' patent, except this arrangement of wheels and carriages and their connection with the car.

The distance of the two trucks apart must be regulated by the length of the car body. I find in Chapman's patent an intelligible description of a truck of four wheels connected to the body by a king-bolt so that it will swivel.

The truck of Chapman's differs from Winans' truck in the relative distance the wheels are apart in proportion to the length of the truck frame, and in the provision for sustaining the load placed upon them. In Chapman's engine, there is a circular railway on the top of the truck frame, on which are conical rollers, if I recollect, placed on



which the load is borne. Winans' truck has no side timbers; the spring takes the place of those. His drawing shows an outside timber, and a spring over each journal. In Chapman's truck the timber is inside of the wheels. In Chapman's there is an inside bearing, and in Winans' an outside bearing. Chapman's drawing shows wheels with a flat tread. The description speaks of ledges on the wheels. I see no other important difference between Chapman's engine and Winans' car except in form and general appearance. The description in Chapman's indicates that another bearing carriage may be substituted for the pair of wheels. There is no circular way or rollers described in Winans' patent.

In the drawing of Chapman, the truck is behind, and the pair of driving wheels with a fixed axle is ahead; in the drawing of the Experiment, the truck is ahead and the driving wheels behind. I think there is a difference in mechanical action between Chapman's engine and Winans' car. The single pair of driving wheels restrains the action of the truck; the one truck requires another truck with a joint, in order to have a free action.

[A model being shown to the witness, he says:]

This model represents parts found in Wood's drawing. Taking the locomotive in Wood's, and taking off the cog wheels and boiler and all the driving part and putting on a body, there is then a difference between Winans' car and the engine in Wood's in the relation of the parts of the running gear to the body.

I find in the treatise and drawing the two trucks are connected with the frame or body by bolsters and king-bolts as in the model. By divesting the carriage described and represented in Wood's treatise of the cog wheels and apparatus, the obstacle to the free motion of the trucks would be removed. I don't think it would require any invention to know that the removal of the cog wheels and apparatus from Wood's Machine, would remove the obstacle to the free motion of the trucks. My understanding of the engine in Wood's is, that the intention is to distribute the weight on each of the wheels equally. The only difference between Chapman's truck, and the truck in the Experiment is, that it works the other end foremost. The general manner of constructing the two and attaching them to the body is the same. Chapman's locomotive would fall further short of answering the present wants of a railroad than the old steamboat of Fulton would of the present steamboats.

[The model of such a timber car as Williams described having a frame, being shown to the witness, he testified as follows:]

A car made like the model with the trucks connected by bolsters and a long frame contain all the principles of the running part of the eight-wheel car. The only difference between the car represented in the drawing of the Columbus and that in the Plaintiff's specification and drawing is, that in the Columbus the draft is by a perch from the truck instead of the body of the car, and in the arrangement of the wheels and trucks as to distance apart.

On being again *re-examined* by the counsel for the Plaintiff, the said William C. Hibbard testified as follows:

The text of Wood says that the object of the arrangement of the trucks is to distribute the weight equally on the rails.

## DEPOSITION OF PETER H. DREYER.

PETER H. DREYER, a witness called by the Plaintiff, testified as follows :

I reside in New York ; am City Surveyor ; I have been engaged on railroads in constructing the tracks ; I am acquainted with the building of cars and with their construction and operation. I have read the specification of Plaintiff's patent and examined the drawing ; the distinctive characters of this plan are first, to construct the trucks with the wheels as near each other as possible, thereby bringing the axles more in a line with the radii of the circles. The next feature is an under and upper bolster, the upper bolster being fastened to a long frame or body and resting on the under bolster, which is connected to the truck. Thirdly, a pin or bolt running through the bolster to allow the trucks to conform to the curves. The best mode of applying the motive power to bring into action the principle of the two trucks is to connect it to the frame ; if attached to the truck, free action is prevented, and would have a tendency to throw the truck off the rails.

The principle of Plaintiff's plan would not be carried out if all the wheels of the car were at an equal distance apart. I do not consider a locomotive with a pair of driving wheels at one end, a truck at the other as involving the principles of Plaintiff's invention.

The introduction of a truck as a substitute for the driving wheels would produce a new mechanical action in turning curves. I don't consider the two four-wheeled platform cars connected by a perch, and arranged to draw timber, as an organized eight-wheel car, such as Winans describes, or equivalent to it ; in passing on to and off of curves the timbers must slide. The substitution of a body for the timbers would not constitute an eight-wheeled car. I am acquainted with cars on Defendant's road ; they are similar to the Plaintiff's. The distance between the wheels of each truck may be varied according to the nature of the curves, being placed further apart the longer the curves. Placing the two trucks at a great distance facilitates the turning of curves ; it also operates to steady the motion. In laying a track, we generally elevate the outer rail in the curves of the road, in order to throw the centre of gravity towards the inside, for the same reason that a person riding in a circle leans inward to resist the centrifugal force.

It is not necessary there should be a leaning the whole length of the bolster ; a foot each side of the centre would generally be sufficient.

I understand the description and drawing in Wood's Treatise. I do not consider that a practical locomotive carriage could be made from the drawing ; there are two trucks, the inner axles being connected by a cog wheel, the motive power connected with the inner wheel ; the free motion of the trucks would be impeded by the meshing of the cogs ; there would be considerable strain on the king-bolts. The amount of the strain would be the whole leverage from the king-bolt to the cog-wheel. The wheels are represented as equidistant, which is not according to Plaintiff's plan. I think the difference between the Plaintiff's plan and that shown in the drawing in Wood's, are material. A running carriage, built with those proportions, dispensing with the loco-

motive, would not conform to the description in Winans' specification. The motive power in the engine in Wood acts on the trucks. The object in that engine, was an equal distribution of the weight on the track.

The witness, being *cross-examined*, testified as follows :

I am a mechanic; I was formerly a carpenter by trade; I was engaged in building cars; am not a wheelwright; never constructed locomotives or carriages for locomotives. I have superintended the laying down of tracks for railroad companies.

My duty as City Surveyor is to make out assessments and make contracts for improving streets. I have taken contracts for constructions on railroads and have some knowledge of engineering. I use a theodolite in leveling. I have worked on frames of cars and on their bodies. The rims of the wheels in Defendant's cars are about fifteen inches apart. The nearness of the wheels is essential, because their axles then come nearer in line to the radii of the curves; it is an essential feature in Plaintiff's plan to place the wheels of each truck as near together as possible and to extend the body; and you could not have that principle if you had all the wheels equidistant apart.

#### DEPOSITION OF WALTER R. JOHNSON.

WALTER R. JOHNSON, called by the Plaintiff, testified as follows :

I reside in Washington city: am at present a Civil Mining Engineer and Solicitor of Patents. My pursuits for the last twenty years have been connected with the investigation, publication and teaching of the principles of Natural Philosophy, Mechanics, and Chemistry. From 1828 to 1837, I was connected with the Franklin Institute of Pennsylvania, as Professor of Mechanics and Natural Philosophy. I was connected from 1839 to 1843, with a medical institution in Philadelphia, as Professor of Natural Philosophy and Chemistry. I was engaged during 1843 and 1844, in experimenting on the strength of iron, and the evaporating power of coal; and since 1844 I have been engaged, in part, in investigating the qualities of coal and their mineral characters and localities; and since 1848 have been engaged in my present pursuits.

From my first connection with the Franklin Institute until 1848, I was more or less engaged in investigations on subjects of inventions pertaining to science and the arts. I have examined Plaintiff's specification and drawing. Its distinctive characters are: placing the body of the car upon two trucks, each of four wheels, with the axles of each truck placed as near to each other as conveniently may be, and placing the trucks as near the ends of the car and as remote from each other as conveniently may be; each truck turning on a swivel or centre-bolt, so as to allow free motion to turn horizontal curves, the traction being by the body of the car. There is no invention of new parts, wheels, axles, or trucks; truck frames, variously constructed car bodies, eight wheels and connecting links for connecting cars in a train, were well known previously to Winans' patent.

But the Plaintiff claims the combination and arrangement of parts in a peculiar way, for the accomplishment of certain purposes stated in the specification. To accomplish these purposes it is best to apply the

traction to the body of the car, so far as regards that tractive force that is exerted between one car and another in a train. If a locomotive draw only the tender, it would probably make little difference whether the connection between the locomotive and car is to the body or the trucks, that is, so far as the connection between the locomotive and the first truck is concerned if the traction is in the direction of the curve to be followed; but as soon as the tender to a locomotive becomes a drawing power, then the coupling must be by the bodies; that is very important; when the draft is alternately through the body and the trucks, each pin has to draw the whole load behind it, and it is therefore more difficult to turn it. But when the cars are coupled by the body, each pin has merely to carry the load on its truck, instead of the load of the whole train behind; but when a train of cars is to be drawn, the attachment to the body is important.

[The drawing of the Columbus being shown to the witness, he says:]

This drawing represents the tractive power as applied by a perch to the trucks. The wheels of the trucks are not placed near each other, in which particular it differs from the Plaintiff's plan.

I don't consider the timber car as an organized eight-wheeled car, like that in Plaintiff's patent. The timbers must slip when a car comes on a curve. If a body were attached firmly to the platform, something must break. In Morris's patent I don't find the distinctive arrangement which constitutes the peculiar character of Plaintiff's invention; there is no provision in it for passing lateral curves, but only for passing vertical inequalities; the difference between the two is a very substantial difference. In Jervis' plan of a locomotive carriage, with one pair of driving wheels and two pairs of running wheels, there are single features in certain parts like features in Plaintiff's plan, but not two trucks placed near the end of a long running car, having connection made through the body. A car with a truck at one end, and a pair of driving wheels at the other end, would not run like Plaintiff's.

I find only a portion of Plaintiff's invention; there is a truck turning on a swivel, but not two trucks, one at each end. The substitution of another truck for the driving wheels would be introducing a new mechanical action. This new mechanical action is to be found in Plaintiff's patent. I have read the description in Chapman's specification, in the 24th volume of the Repertory of Arts, &c. I do not find a running carriage described, similar to the Plaintiff's. A locomotive carriage is described to be drawn by a chain along the road. It is practicable, but not a practical way of moving a car at this day.

The object of Chapman seems to have been to distribute the weight by multiplying the wheels. Supposing Chapman's to be a running carriage, it is one in which the distribution of the weight throughout the car is intended to be effected by the simple distribution of the weight on the wheels, without regard to the nearness of the axles and the distance of the trucks. In Chapman's locomotive the weight is distributed at equal distances on the rails. Figure No. 1 of the drawing represents a four-wheel carriage. The next is one of six wheels, the forward pair of wheels being rigid. The truck of four wheels has a swivel, and is capable of adjustment for turning curves.

When Chapman speaks of constructing a car with eight wheels, he speaks of distributing the load on eight wheels, and does not indicate



the idea found in Winans' specification, that the wheels are to be near together, and the trucks far apart. If the eight wheels of Chapman were distributed as Chapman indicates, on a car of the usual length used on our roads, they would not easily conform to the curves; no degree of curvature can exist that will not be relieved by the near approach of the axles, and the longer the distance apart of the trucks the steadier will be the motion of the cars. These distinctive features I don't find in Chapman's locomotive.

A car constructed on Plaintiff's plan may run with one truck on one track and the other on a parallel track. I have seen this done. This could not be done with a car on the plan of the "Experiment," because the driving wheels would be perpetually restrained by their fixed axles. I have examined the description and drawing of a locomotive in Wood's Treatise. I find it represents a locomotive in which all the wheels are driving wheels, and are geared together by toothed wheel and pinion works; the motive power being a steam engine connected with the carriage or frame, and the driving machinery seems to be connected with two trucks. There is a wheel in the centre connected with the shackle bar that meshes into another wheel which connects with one of the middle pair of the driving wheels of the four, and between that pair and the one next to it is another cog and so on.

I think the impingement of the cogs would impede the action of the carriage by interfering materially with the free play of the trucks in moving around curves. I don't perceive any arrangement of the wheels of each truck near together, or for the distant coupling of the trucks for the objects stated in Plaintiff's specification; nothing is said in this work about running carriages; all running carriages were then made with four wheels.

The witness being *cross-examined*, testified as follows:

By arrangement in machinery I understand the placing the parts in particular positions in relation to each other.

In the Plaintiff's specification the arrangement of eight wheels is making two bearing carriages or trucks, and placing the two trucks remotely from each other; that is remotely as compared with the distance of the wheels from each other in the trucks, and with the former distance of the wheels from each other in four-wheel cars; and I consider remoteness of the trucks from each other as compared with their distances from the ends of the car as a feature of Winans' plan. No specific distance is indicated. It will depend on the length of the car. Of course the trucks cannot be more remote than the whole length of the car, and the remoteness of the trucks is with reference to the length of the cars. In the drawing, the centre of each truck is further from the centre of the car than from the end of the car nearest to it.

The specification does not direct at what distance apart the trucks are to be placed on a car of any specified length.

The connection of the wheels with the body is represented as being made by an upper and lower bolster to each truck with a centre-pin or bolt descending through the upper bolster into a cavity in the lower bolster; the upper bolster is adapted to touch the lower bolster in certain parts, to avoid rocking.

In Chapman's specification in the Repertory of Arts, I find described a bearing carriage of four wheels made in a truck frame, and a car-

riage upon it connected by a centre-bolt which gives the carriage the property of turning lateral curves. It is stated in the specification of Chapman in the Repertory of Arts, that another truck may be substituted for the fixed axle with its wheels. I am informed by the specification that another truck, similar in all respects to the first described, may be substituted for the two wheels and fixed axle; and I understand they are to be connected to the carriage in the same way as the first truck, although there is no direction or instruction in the specification to that effect.

It appears by the drawing in the Repertory of Arts, that the power of traction in Chapman's carriage was applied to the four-wheel car where the body and the truck are one; therefore, the traction is applied to the truck. The model exhibited is a fair representation of the eight-wheeled carriage in Wood, stripped of the cog-wheels and other apparatus by which it was to be moved.

I think a curve of thirty feet radius is as small a curve as I ever saw on railroad. The truck of the Experiment, as exhibited in Jervis' drawing, and the truck described in Chapman's specification in the Repertory of Arts, are constructed and connected to the carriage substantially in the same way as Plaintiff's trucks are constructed and connected. There is nothing said in Plaintiff's specification respecting the mode of attachment to the motive power and to other cars, but I find it delineated in the drawing.

The drawing of the Columbus differs from the drawing of the patent in regard to the relative distance of the centres of the trucks from the centre of the car, in comparison to the total length of the car. The wheels of the Columbus are further apart also. They differ also in the draught of the Columbus being by the trucks when the wheels of the bearing carriages are so far apart as to interfere materially with their action on the curves of the road on which they are used; they will not interfere with Winans' patent. The position of the axles of the Columbus would, I should think, render it unsuitable to traverse some of the shortest curves. If Winans' cars were to traverse roads of long curves, I should think the Columbus would be within his plan as regards the position of the axles. The curves were very short in the Baltimore and Ohio Railroad, and I do not think the Columbus would for this road be within the distinctive characteristics of Winans' invention, so far as the nearness of the wheels together is concerned. Placing it on another road with long curves would bring it within the characteristics, if the trucks were placed so far from the ends as to have the ill effects which Mr. Winans wishes to avoid; this would take the car out of Mr. Winans' plan. It would take it out of the invention if the trucks were so far apart as to defeat Mr. Winans' object.

I should think from the drawing, the trucks of the Columbus are placed too far from the ends of the body to bring it within Plaintiff's patent; there is an approximation to it, but rather a remote one. I think if the Columbus were divided into two parts, each part would rest nearly centrally on one set of wheels, and that, in my opinion, is too far from the end.

The Plaintiffs here rested. The Defendants *re-called Mr. Pond*, who testified that none of the Defendant's trucks are connected by a single spring, such as is described in the Plaintiff's specification.

It was agreed by the counsel of the respective parties, that if the jury think the Plaintiff entitled to recover, the damages shall be assessed at one hundred dollars.

The cause was summed up to the jury, and the Defendant's counsel before the Judge charged the jury, delivered to him, in writing, the following prayers, and requested the Court to charge and instruct the jury in conformity with these prayers :

THE TROY AND SCHENECTADY RAILROAD COMPANY *adsm.* ROSS WINANS.

The counsel for the Defendants respectfully pray the Court to instruct the jury :

I. That a patent cannot be obtained for a purpose, intent, end or object, but must be for the machinery or process by which such purpose, intent, end or object is to be accomplished, and whatever may be the purpose or object of the improvement, the patent will be void if the machinery or process by which it is to be effected is not new.

II. That the Plaintiff's patent is (in the words of his patent) claimed to be "for a new and useful improvement in the construction of cars and carriages intended to run on railroads."

That this includes all kinds of carriages or cars intended to run on railroads.

III. That by the Plaintiff's summary as expressed in his specification, this improvement is claimed to consist only of the manner of arranging and connecting the eight wheels which constitute the two bearing carriages with a railroad car.

IV. That the mode of attaching the car to the motive power, or to other cars to be drawn in trains, forms no part of the improvements claimed by the Plaintiff, and cannot therefore be taken into consideration in determining whether all or any part of the improvement claimed by Plaintiff is new.

V. That an eight-wheel car is no part of the improvement.

VI. That the remoteness of the two bearing carriages from each other when attached to the car, is not so expressed or described in the specification as to constitute any part of the improvement claimed by the Plaintiff.

VII. That the improvement claimed by the Plaintiff consists only :

1st. Of the manner of arranging the eight wheels into two trucks, which constitute the two bearing carriages. That this arrangement includes the bolsters placed in the centre of each bearing carriage, and the placing the axles of each truck as near together as could be done without the flanges of the wheels interfering with each other.

2d. Of the manner of connecting the two bearing carriages to the body of the car by a centre-pin or king-bolt passed through the centre of the upper bolster, which is attached to the body of the car into the lower bolster on the two bearing carriages.

VIII. That if the jury shall find that any part of the arrangement of the eight wheels into the two trucks, or the manner of connecting these trucks to the body of the car, were known and used before the alleged improvement by the Plaintiff, the patent is void.

IX. If the jury find that prior to the alleged invention of the Plaintiff, there was published in any public work a description of a car to run on railroads, resting on two bearing carriages composed of four wheels, each having a bolster extending across in the centre between the two wheels, fastened to and forming a part of the carriage, and attached to these bolsters by a centre-pin or bolt passing through the substantial frame of the car in the centre of the bolsters, so as to allow the frame of the carriage to turn and swivel upon the bolsters of the bearing carriage, the Plaintiff's patent is void.

X. If the jury find that any part of the arrangement of the eight wheels into bearing carriages, or the manner of their connection with the frame or body of the car is described or delineated in Chapman's patent, published in the 24th volume of the Repertory of Arts, published in 1814, or in Mr. Wood's Treatise, published in 1825, the Plaintiff's patent is void.

XI. If the jury find that it was known to persons acquainted with the science of mechanics and mechanical motion, that a four-wheel carriage with its axles in close proximity would traverse a curve more easily than if further apart, then that part of the arrangement described and claimed in the specification is not new, and the patent is void.

XII. If the jury shall find that the timber car found to have been used on the Baltimore and Ohio Railroad before the car "Columbus" was built, embraced any part of the manner of arranging or connecting the eight wheels to the body of the car, as claimed in the Plaintiff's specification, his patent is void; and that it makes no difference that said timber car was only used temporarily, or for a temporary purpose.

XIII. If the jury find that the car Columbus does not substantially embody the whole improvement claimed by the Plaintiff, and shall also find that the truck of four wheels constructed by Mr. Jervis in the winter of 1832 for the Experiment, and put in use on the Mohawk and Hudson Railroad in April 1832; or that the timber car proved by Mr. Williams and Mr. Whitney to have been constructed and put in use on said road in April or May, 1832, contains any part of the arrangement or connection of the eight wheels to the body of the car claimed in the Plaintiff's specification, his patent is void.

XIV. If the Court shall be of opinion that the remoteness of the two bearing carriages, as described in Plaintiff's specification, constitutes a part of the arrangement of the eight wheels to bearing carriages and the connection to the body of the car as claimed in the Plaintiff's specification, then the patent is void, unless the jury shall find that the specification describes with sufficient precision the proper and necessary location of those bearing carriages under the body of the car, to enable a mechanic of sufficient skill to construct railroad cars, to locate the bearing carriages under the car the necessary distance apart, without any experiment, invention, or addition of his own.

XV. If the jury shall find that a car constructed as described in Plaintiff's specification without side bearings at the ends of the bolsters would not be entirely safe to passengers, the patent is void.

XVI. If the jury shall find that the car Columbus embraces in substance the improvements claimed in the Plaintiff's specification, and



that said car was put into use by the Baltimore and Ohio Railroad Co. on the 4th of July, 1831, and that it was occasionally used by said Company from that time by the consent of the Plaintiff, then the patent is void.

XVII. If the proximity of the axles of the bearing carriages and any particular remoteness of those bearing carriages from each other, forms any valid part of the improvement claimed by the Plaintiff, unless the jury find that both the proximity of said axles, and the remoteness of said bearing carriages from each other in the Defendant's cars are the same as that claimed by the Plaintiff to be his improvement, then there has been no infringement and the Defendants are entitled to a verdict.

XVIII. The patent is void on its face, because,

1. There is not in the specification any sufficiently precise or certain rule for the arrangement and connection of the bearing carriages with the car, to accomplish the objects of the pretended invention.

2. The end proposed by the patentee is stated in the specification, but no means of accomplishing it are described, other than the application of known mechanical principles, in such manner as will best accomplish that end or object.

3. The claim is for an improvement to accomplish the "end proposed" by such arrangement and adjustment of things in use as will accomplish that end, but the specification leaves the rule or particular manner of arrangement and adjustment to be discovered and applied.

4. The specification leaves the manner of arrangement and connection of the bearing carriages or wheels for the accomplishment of the purpose or end the patentee has in view, as much a matter of accident or experiment as they were before the specification was written.

5. The patent is for a car to be constructed upon such known mechanical principles, and with such mechanical arrangement as may be found necessary to attain the "end" or accomplish the purpose stated in the specification and claimed, without describing what that mechanical arrangement or combination must be.

The Court then charged the jury, and among other things:

In respect to the Defendant's first prayer, the Judge stated to the jury, that it was undoubtedly true, that a patent could not be taken merely for a purpose, end, or object, but that it would in his judgment be impertinent to give any instruction to the jury on that point, because the patent in question here was not a patent for a purpose, but for the means of effecting a purpose.

To the latter remark of the Judge, Defendant's counsel excepted.

The Judge then remarked, that he had charged in accordance with the Defendants' second and third prayers substantially, to which remark the Defendant's counsel assented.

In respect to the matter of the fourth prayer, the Judge charged that although the mode of attaching the car to the motive power or to other cars in a train forms no part of the improvement claimed by the Plaintiff, he refused to charge as requested; that the jury could not take the mode of attachment into consideration, in determining whether all or any of the improvements claimed by the Plaintiff are new, but charged that the mode of attachment might be taken into consideration

for the purpose of ascertaining whether the Plaintiff had complied with the law by describing his invention, and showing how it was to be used; that the specification was sufficient if the patentee had described a carriage susceptible of an attachment of the power to the body, if the drawing showed such mode of attachment; that the Plaintiff could suffer no disadvantage from not having stated it in his written specification, and that although the drawing was not to be taken into consideration, for the purpose of measuring the extent of the patentee's claim, yet it might be considered in ascertaining whether what he claimed was new if the jury could discover that it had any bearing on this point.

To this refusal of the Judge to charge as requested in the fourth prayer, and to his instructions relative to the mode of attachment, the Defendants' counsel excepted.

The Judge then remarked, that he had charged in accordance with the Defendants' fifth prayer substantially, to which remark the Defendants' counsel assented.

To the refusal of the Judge to charge as requested in the Defendants' sixth prayer and to his charge to the contrary, the Defendants' counsel excepted.

The Court charged the jury in accordance with the seventh prayer, but added that the position of the truck at or near the end of the carriage, was to be considered as constituting a part of the arrangement claimed by the Plaintiff as his invention.

To this last mentioned instruction, the Defendants' counsel excepted.

The Judge refused to charge as requested in the Defendants' eighth prayer, that if the jury should find that any part of the arrangement of the eight wheels into the two trucks, or the manner of connecting those trucks to the body of the car, were known and used before the alleged improvements by the Plaintiff, the patent is void; to which refusal of the Judge so to charge the Defendants' counsel excepted.

The Court declined to give the instructions specified in the ninth and tenth prayers, in the form therein requested, but left it to the jury to say whether in their opinion it had been shown that the alleged invention of the Plaintiff was substantially described in either of the books mentioned in the tenth prayer, and instructed the jury that if it was so, the patent was void.

The Judge refused to charge as requested in the eleventh prayer for instruction, that if the jury found that any part of the arrangement of the eight wheels into bearing carriages, or the manner of their connection with the frame or body of the car, is described or delineated in Chapman's patent, published in the 24th volume of the Repertory of Arts, published in 1814, or in Wood's treatise, published in 1825, the Plaintiff's patent is void; to which refusal the Defendants' counsel excepted.

The Court refused to give the instructions mentioned in the twelfth and thirteenth prayers in the form therein requested; but after informing the jury that unless the Plaintiff appeared by the evidence to be the first inventor of all that by his patent he claimed as his invention, his patent was void; and after submitting to them the evidence relative to the timber carriage mentioned in the twelfth prayer, and also that respecting the four-wheel truck devised by Mr. Jervis for the locomo-

tive Experiment, and the timber carriage mentioned in the thirteenth prayer, the Court left it to the jury to decide whether or not it was shown by this evidence that the Plaintiff was not such inventor, and declined to give any other or further instructions in answer to these prayers; to which refusal the Defendants' counsel excepted.

The Court gave the instructions contained in the fourteenth prayer, and left it to the jury to say, whether the Plaintiff had not, as it appeared to the Court he had done, sufficiently indicated the position of the trucks with respect to the ends of the carriage; as to their distance apart, that of course must depend on the length of the carriage.

In relation to the fifteenth prayer, the Court instructed the jury that in order to find for the Plaintiff, the jury must be convinced that what the Plaintiff has patented is useful, but that any degree of utility was sufficient to support a patent, the word "useful" in the patent law being used in opposition to "frivolous" or "noxious," and that with regard to the question of side bearings, although the jury should think it better to have longer bearings than the Plaintiff contemplated, that would not warrant them in finding the patent void, if the invention was useful within the instructions given, as it was not necessary that the thing patented should be the best possible thing of the kind that could be made with, and the Court refused to charge the jury otherwise in relation to said fifteenth prayer; to which refusal and instruction the Defendants' counsel excepted.

In relation to the sixteenth prayer the Court instructed the jury that the law allowed to an inventor a reasonable time to perfect his invention and to ascertain its utility before, in order to secure to himself its exclusive use; it obliged him to take out his patent, that in applying this rule it was the duty of the jury to take into consideration the nature of the invention and all the circumstances of the case, but that an inventor was bound to act with sincerity and good faith towards the public, and in accordance with the policy of the patent laws. If he unnecessarily defers his application for a patent, and suffers his invention to be used except for the purposes already mentioned, and beyond what he has reason to believe necessary for these purposes, his patent will be void, and that this instruction was intended to embrace the evidence relating as well to the Winchester, Dromedary and Comet, as to the Columbus mentioned in the sixteenth prayer, and in relation to this prayer the Court refused to give any further or other instruction; to which refusal and charge the Defendants' counsel excepted.

In relation to the seventeenth prayer of the Defendants, viz.: That if the proximity of the axles of the bearing carriages and any particular remoteness of these bearing carriages from each other forms any valid part of the improvement claimed by the Plaintiff, unless the jury find that both the proximity of said axles and the remoteness of said bearing carriages from each other in the Defendants' cars are the same as that claimed by the Plaintiff to be his improvement, then there has been no infringement, and the Defendants are entitled to a verdict.

The Court instructed the jury that in order to warrant them in finding the fact of infringement, they must be satisfied from the evidence that the Defendants have used either the same thing, or substantially the same thing, as the Plaintiff's invention, and the Court refused to charge otherwise in relation to said seventeenth prayer.

The Court also instructed the jury that the drawing, a certified copy of which had been given in evidence by the Plaintiff, was to have the same force and effect as if it had been referred to in the specification, and was to be deemed and taken as a part of the specification; to which instruction the Defendants' counsel excepted.

And the Court further instructed the jury that the application of a thing already known to a new and useful purpose might be the subject of a patent, provided the new use was not analogous to the old, and required the exercise of the inventive faculties; to which instruction the Defendants' counsel excepted.

The 6th, 8th, 11th, 15th, 16th, 17th and 18th prayers were refused by the Court, and to these several refusals the Defendants' counsel excepted. The jury thereupon retired to deliberate on their verdict, and returned into Court and delivered their verdict in favor of the Plaintiff for one hundred dollars damages and six cents costs.

The original depositions which were used in evidence, which are on file together with the drawings annexed thereto, to be produced at the argument, and either party may produce on the argument the models which were given in evidence on the trial.

DAVID BUEL, JR.,  
*Att'y and of Counsel for Def'ts.*

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### EXHIBIT, No. 1.

For this Exhibit see page \*425.

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### SPECIFICATION OF EPHRAIM MORRIS' PATENT.

### EXHIBIT, No. 2.

For this Exhibit see page \*418.



## JUDGE'S CHARGE.

CIRCUIT COURT OF THE UNITED STATES, NORTHERN DISTRICT OF NEW YORK.

ROSS WINANS vs. THE TROY AND SCHENECTADY RAILROAD COMPANY.

His Honor, JUDGE CONKLING, charged the jury as follows, in substance: This trial, gentlemen, has been so deliberately conducted, and the whole merits of the case have been so fully investigated, that I shall endeavor not to detain you very long in summing it up.

This suit is brought to recover damages for the alleged violation of the right claimed by the Plaintiff in virtue of letters patent granted to him on the first day of October, 1834, and subsequently extended. The Plaintiff's right to maintain his action depends on the answers to be given to the two general questions: First, whether he has a good patent, and if so, secondly, whether it has been infringed by the Defendants. To enable you to decide these questions, it is indispensably necessary that you should have a clear conception of the thing of which the Plaintiff claims to be the inventor, and this is to be ascertained from the description which he has himself given of it. The law requires every applicant for a patent to accompany his application with a full, clear and exact description of his supposed invention, and it is to this description thus furnished by the Plaintiff, that resort must be had to ascertain the nature and extent of his invention. This question must, of course, arise in every case of this nature, and it is often one of no little difficulty, especially in a case like the present, where the invention consists in an alleged improvement in a thing already in use, because the party is obliged to distinguish between what is old and what he claims as his invention, and this is often very imperfectly done.

But the present case does not appear to me to involve any serious difficulty in this respect. The specification is drawn with great precision and perspicuity. Indeed, I do not remember ever to have seen a specification expressed in clearer or more appropriate terms. It is very easy, therefore, at least to understand what the patentee designed to say. He describes the carriages then already in use, and the practical difficulties resulting from the form and manner of this construction; he then proceeds to state in what respects and in what manner he has altered them for the purpose of obviating these difficulties, and it is the means resorted to by him for this purpose that he claims as his invention and improvement. These carriages had four wheels arranged in pairs, each pair having a fixed axle, and he shows the disadvantages attending the use of such carriages, especially on roads having curves of so short a radius as many of them in this country have.

"The object of my invention," he says, "is, among other things, to make such an adjustment or arrangement of the wheels and axles as shall cause the body of

the car or carriage to pursue a more smooth, even, direct and safe course than it does as cars are ordinarily constructed, both over the curved and straight parts of the road by the beforementioned desideratum of combining the advantages of the near and distant coupling of the axles and other means to be further hereinafter described."

This is the object of the Plaintiff's invention as stated by him; he then goes on to describe the means he has invented to effect the object he has specified, and here again I will read to you his own language:

"For this purpose," says he, "I construct two bearing carriages, each with four wheels, which are to sustain the body of the passenger or other car by placing one of them at or near each end of it in a way to be presently described. The two wheels on either side of the carriages are to be placed very near to each other; the spaces between their flanges need be no greater than is necessary to prevent their contact with each other. These wheels I connect together by means of a very strong spring, say double the usual strength employed for ordinary cars, the ends of which spring are bolted or otherwise secured to the upper sides of the boxes, which rest on the journals of the axles, the larger leaves of the springs being placed downwards and surmounted by the shorter leaves. Having thus connected two pairs of wheels together, I unite them into a four-wheel bearing carriage by means of their axles and a bolster of the proper length, extending across between two pairs of wheels, from the centre of one spring to that of the other, and securely fastened to the tops of them. This bolster must be of sufficient strength to bear a load upon its centre of four or five tons. Upon this first bolster I place another of equal strength, and connect the two together by a centre-pin or bolt passing down through them, and thus allowing them to swivel or turn upon each other, in the manner of the front bolsters of a common road wagon. I prefer making these bolsters of wrought or cast iron; wood, however, may be used. I prepare each of the bearing carriages in precisely the same way.

"The body of the passenger or other car I make of double the ordinary length of those which run on four wheels and capable of carrying double their load. This body I place so as to rest its whole weight upon the two upper bolsters of the two beforementioned bearing carriages or running gear. I sometimes place these bolsters so far within the ends of the body of the car, as to bring all the wheels under it; and, in this case, less strength is necessary in the car body than when the bolster is situated at its extreme ends. In some cases, however, I place the bolster so far without the body of the car at either end, as to allow the latter to hang down between the two sets of wheels or bearing carriages, and to run, if desired, within a foot of the rails."

He then goes on to speak of some particular features of this invention, and finally he states explicitly in a summary at the end of the specification, what he claims and what he does not claim, as follows:

"I do not claim as my invention the running of cars or carriages upon eight wheels, this having been previously done; not, however, in the manner or for the purposes herein described, but merely with a view of distributing the weight carried more evenly upon a rail or other road, and for objects distinct in character from those which I have had in view as hereinbefore set forth. Nor have the wheels, when thus increased in number, been so arranged and connected with each other either by design or accident as to accomplish this purpose. What I claim, therefore, as my invention, and for which I ask a patent, is the before described manner of arranging and connecting the eight wheels which constitute the two bearing carriages with a railroad car, so as to accomplish the end proposed by the means set forth, or by others which are analogous and dependent upon the same principles."

This, then, is the improvement of which the Plaintiff claims to be the inventor. I do not know that I can give you a more clear idea of it than has been given you by the reading of it. You have heard read in the course of the trial, the instruction given on a trial at Baltimore, by the Chief Justice of the United States, as to the claim of the patent; and that instruction, which seems to me to be entirely proper, and which I desire to be considered as adopting, is couched almost wholly in the very language of the specification.

It is, then, the improvement which he thus describes, of which the patentee claims to be the inventor.

The next question, gentlemen, is, whether the Plaintiff has given a sufficient description of his invention. A patentee is bound to give all the information necessary to the successful use of the invention. It is denied by the Defendants that the Plaintiff has complied with this condition, and they insist that the patent is therefore void. It is, among other things, insisted by the Defendant's counsel, that the Plaintiff ought to have specified the distance at which the trucks are to be placed from each other, and that he has not done so. This objection relates to an important part of his invention, and the successful use of it depends upon the arrangement of the wheel and truck; the two pairs of wheels in each truck must be near together, and the trucks remote from each other. The Plaintiff was, therefore, bound to give instructions as to the location of the wheels and trucks.

It is also said that he has given no directions as to the length of the body of the car, but he says that the body admits of indefinite extension, and in that he considers the value of his invention to consist. Its length, therefore, is left to be determined by choice and circumstances. He could not specify the particular number of feet between the trucks, and it appears to me that he has specified with sufficient exactness the part of the carriage where the trucks are to be placed. He says they are to be placed at or near the end of the car; sometimes he says he places them just under the end, and at others just without the end. They must, therefore, be placed near the ends of the car, or in other words as far apart as the length of the carriage will conveniently admit. It is very true that a patentee is bound to give full information to the public as to the manner of carrying out his invention, but he is not bound to inform the public of more than he knows.

It is said to be at present the practice to place the truck a little further under the carriage, but it is proper to consider the circumstances under which the Plaintiff made his invention, if such it be. At that time there was only one short railroad, the Mohawk and Hudson, in full operation, with portions of some others. It was then that he commenced the invention of a better car, and in applying for a patent he could only be required to inform the public of all that he had then ascertained, and though the carriage may have been improved by others, this constitutes no valid objection to his patent, if the thing he has invented was new and useful, and he has in good faith disclosed it to the public. A patent is none the less valid because a better thing has been subsequently invented. So far as I can discern, there is not the slightest reason to suppose that the patentee has designedly kept back anything known to himself which the public had an interest in knowing.

It is said, moreover, that the Plaintiff has not indicated in his speci-



fication the point or part of the car at which the motive power is to be applied, while, at the same time it is here insisted by his counsel that in order to the beneficial working of his invention it is highly important that this power should be applied directly to the body of the car instead of the truck, to which it appears to have been uniformly attached before his invention. If it has been shown by proof that the patentee had discovered that this change was beneficial, and had concealed the fact, it may be conceded that this would have been sufficient to invalidate his patent.

It is true that he has not stated in his written specification, where the motive power is to be attached, but this is one of those cases in which the inventor is not only permitted but required by law to accompany his application with a drawing explanatory of his invention; this drawing is to be accompanied with written references. There may be cases in which it would be better, perhaps necessary, to incorporate these references in the written specification, but the law does not require this to be done, provided the description and drawing can be rendered sufficiently intelligible without. The Plaintiff has furnished a drawing with written references on the same paper, and the witnesses tell us, as indeed we see to be the fact, that the drawing clearly indicates the point of traction.

The drawing, therefore, is none the less efficacious for not being referred to in the writing; being deposited along with the written specification in the Patent Office, it is equally accessible to the public. It is a part of the specification, and if it is intelligible, that is sufficient to satisfy the requirements of the statute. If, indeed, the infringement complained of had consisted in the use by the Defendants of this new mode of traction, the action, I think, could not be maintained, for I am of opinion that according to the true construction of the specification, the Plaintiff's claim does not extend to this mode of coupling, it not being mentioned at all in the written specification, and his claim being "the before described manner of arranging and connecting the eight wheels," &c. he has limited himself to what he had before described; nor do I understand him now to claim anything beyond this. But what the Plaintiff complains of is, the use by Defendants of his entire railway carriage. The objection to which I am now directing the attention of the jury is that he has not sufficiently described his invention, and in answer to their objection, he is entitled, as I have already said, to point to this drawing.

Again, it is said that the patentee has omitted to describe side bearings; that the provision made by him as represented by his drawing is insufficient for this purpose; that a carriage constructed according to his drawing would be unsafe and therefore useless, and that his patent is therefore void. This question depends upon the drawing. There seemed at first to be some diversity of opinion among the witnesses as to whether the bolsters shown in the drawing came in contact with each other except at the centre, but it appeared to be finally agreed, that there is a bearing shown on each side of the centre-pin, though the witnesses are not perfectly agreed as to the extent of the bearing. Mr. Pond applied his rule to the drawing, and by the aid of the scale from which the drawing was made, stated the bearing to be about sixteen inches on each side, while some other witnesses made it



less. It is testified, however, that a large number of cars were made for the Baltimore and Ohio Railway according to this specification and with this extent of bearing, that they were successful and that they have been in use ever since. Mr. Glenn says that they are made in that way still.

But, gentlemen, I have already taken occasion to observe that a patentee is only bound to disclose all that he has ascertained. At the time of this invention, railroad cars were not run at the speed at which they are now moved, and if it has been discovered since that the Plaintiff's bearings are insufficient for the present rates of speed, that can be no objection to the patent. The patentee probably had no idea of the present rates of speed, and what he desired to invent was something applicable to the rates of speed then known. Mr. Williams, a very intelligent witness for the Defendants, says that these bearings are not sufficient for our present rates of speed, but that in his opinion, they are sufficient for the rate of fifteen or even twenty miles an hour, and it is no objection to this patent that the bearings shown are not sufficient for the rate of forty miles an hour.

The next question, gentlemen, for your consideration is, whether the Plaintiff is indeed the inventor of that which he claims. This is denied by the Defendants. The first evidence upon this point on the part of the Plaintiff, is the patent itself. The patent is *prima facie* evidence of the novelty of the thing claimed, and it is sufficient evidence until the contrary is shown and this should be so; for the patentee when he takes out a patent must describe his invention and make oath to it; and moreover, no patent can properly be issued unless the Commissioner of Patents believes the applicant to be the true inventor. It is therefore right that the mere production of the patent should be sufficient evidence in and of itself of the novelty of the asserted invention until it is disproved. It is, however, the right of the Defendant to contest the novelty of the invention. If he can show by a satisfactory preponderance of evidence that the patentee was not the inventor, then the patent must fail. I understood it to be suggested by one of the counsel for the Defendants that the patentee was bound to prove beyond a reasonable doubt that he was the inventor; this is certainly a great mistake. On the contrary, it is the Defendants who are bound to prove to your satisfaction that the Plaintiff was not the inventor. The Defendants hold the affirmative, and must maintain their allegation by a preponderance of evidence.

Wherever a Plaintiff receives notice of a defence on the ground of a want of novelty in the invention, he may upon the trial, after producing his patent, either rest his evidence on the point of invention, or he may anticipate the defence, and endeavor by additional evidence to fortify his case in the first instance.

The Plaintiff here has adopted this latter course, and has given the history of his alleged invention. On his return from England in June, 1830, he entered into the service of the Baltimore and Ohio Railroad Company, having been engaged by the Chief Engineer, with the approbation of the Directors, as his assistant. He entered into a contract with the Company to give them the benefit of his talents in preparing for the successful operation of their road. They were to pay him a specified salary, and allow him the use of their workshops and tools

and of their road, for the purpose of making experiments, and it was agreed that they should be entitled to the use of what he invented, but there was nothing in that agreement which could deprive him of the right to a patent for his invention. In pursuance of this agreement, as the Plaintiff alleges, the passenger car Columbus was constructed; he insists that he was the inventor of it, and that it was built under his directions. To establish this, he has introduced the depositions of Mr. Thomas, the President of this Company, Mr. Brown, the Treasurer, Mr. Knight, the Chief Engineer, Mr. Elgar, an Assistant Engineer, and Mr. Latrobe, the counsel. These gentlemen were intimately connected with the road, and strongly interested in knowing every thing that went on. They all concur in saying that Mr. Winans devised the Columbus.

We then have the drawing which has been produced by Mr. Cromwell. He and Mr. Glenn testify that they assisted in making this very car, that the drawing was made by Mr. Winans, and furnished by him for the purpose of having a car built in conformity to it. They also testify that the draft of the running gear was copied from this drawing upon a board to work from, and Mr. Glenn states that this was done by Mr. Gatch in the shop upon a bench within two feet of where he, Glenn, was working. We then have a description of the progress of the work, and the concurrent testimony of all the persons connected with it, except Gatch, ascribe the invention to Mr. Winans. But Mr. Gatch in his deposition says that he believes himself to have been the contriver of this carriage; he was the foreman of the shop where it was made, and says that according to his recollection, the drawing furnished by Mr. Winans represented only the body of the carriage, and that the drawing of the trucks on the board was his own original work. This diversity of recollection is somewhat remarkable, and it may not be easy to account for it; the explanation suggested by one of the counsel for the Plaintiff is, that Gatch having been engaged in the construction of the cars, and having thus at once become familiar with all its parts, which, after all, are few and simple, may have erroneously imagined that it was his own invention.

But it will be for you, gentlemen, to say how the fact is, and whether the recollection of Mr. Gatch ought to prevail against that of all the witnesses officially connected with the road whom I have named. You will bear in mind also, that it was the especial duty of Mr. Winans to direct his attention to improvements of this nature, and that this was no part of the duty of Mr. Gatch, whose business it was to see that the mechanical work committed to his charge as foreman, was done, and to labor upon it himself.

It appears from the drawing of the Columbus, and from the evidence, that the trucks were placed at a considerable distance from the ends of the body of the carriage, and that the wheels composing the trucks were placed much further apart than in the car described in the patent; that the power was attached to the truck instead of the body, and that the axle ran in friction boxes. The Columbus was put into use late in June or early in July, 1831, when a trial trip was made with it to Ellicott's Mills; the witnesses say that it was used with horse power; that it did not work well and was not satisfactory, and that it sometimes ran off the track. Other eight-wheel cars were subsequently built, but

none until 1833. Little seems to have been at that time done upon the road, and but few cars to have been needed. The witnesses say that the Columbus was used only occasionally, that Mr. Winans was not satisfied with it, and that he subsequently caused the Winchester, the Dromedary and the Comet, to be constructed. The precise date of the construction of these does not appear; but the Winchester seems to have been made in 1833, and the Dromedary and Comet early in 1834. The witnesses gave the same account of these as of the Columbus, that they did not work well, were unsatisfactory, and that there was a desire to get something better.

In October 1834, the carriage described in the patent is stated by the witnesses to have been devised by Mr. Winans, and to have been formally adopted by the Company, and directions were then or soon after given for making a considerable number; they were made during the fall and succeeding winter, and in the spring of 1835 were put on the Washington Branch. All the witnesses represent Winans as engaged in devising a suitable car, and with the exception of Mr. Gatch, represent him as the original and only inventor. This is evidence on the point of novelty, given by the Plaintiff in addition to his patent.

On the part of the Defendants, however, it is insisted that carriages substantially like that in question, were previously described in certain public works, and to establish this they produce two English books, *Wood on Railroads*, published in 1825, and a volume of the *Repertory of Arts*, published in 1814. They insist that each of these contains a description and drawing of what is substantially like the railroad car which the Plaintiff has patented. I shall not enter into a detailed explanation of the drawings and descriptions contained in these books, nor recapitulate the views and arguments concerning them, which have been so elaborately presented to your consideration by the counsel on the one side and the other, but shall content myself with calling your attention presently to some principles of law applicable to the subject.

Before doing so, however, it is proper also to remind you, that in addition to what appears in these English works, it is insisted that the whole of the Plaintiff's invention is to be found in a carriage invented by Ephraim Morris, in 1829, for the purpose of conveying boats from one level to another on the Morris Canal, thereby dispensing with the use of locks for that purpose. A model of this carriage has been produced, and the patentee himself has been brought as a witness. He is of opinion, it seems, that his car is the same in principle as that of the Plaintiff. I have little to observe concerning it; it seems to me, I confess, to be rather a far fetched thing, neither designed nor adapted for any such purpose as the Plaintiff's car. It was made to surmount a series of vertical angles, formed by successive inclined planes, and it is therefore provided with several four-wheeled trucks, the wheels of which, on each side, rise or fall alternately, so as to adapt them to the support of the carriage on the varying planes which it had to encounter in its progress. But it is very clear that there is nothing in this arrangement to fit it for use on a curved railroad. Mr. Morris had, in its invention, no view to the objects which governed the patentee in this case, and consequently his carriage looks like a different thing from the Plaintiff's. But, gentlemen, the question of its substantial identity, is a question of fact, and it is for you to decide it.



It is shown also, that before the construction of the Columbus, a timber car on eight wheels was used on the Baltimore and Ohio Railroad; two common earth or stone cars, each with four wheels, at a considerable distance apart, were attached together by a reach, for the purpose of transporting long timber. To avoid the difficulty of turning the curves, a bolster was put upon each car and a centre-pin through the middle of each bolster, and on these bolsters the timber was placed; the power was applied to the truck, there being, indeed, no other place to apply it; and it has been testified and explained by the witnesses, that although these moveable bolsters would facilitate the passage of this vehicle around curves, the loading would nevertheless crowd and slide upon them. It is denied also, by the Plaintiff's counsel, that this timber carriage can properly be regarded as an organized vehicle, being made up for temporary use of parts designed and generally separately used and for other purposes, and that it is idle to pretend that it is like the passenger car described in the patent. Of this you are to judge.

It is further alleged by the Defendants that the Experiment and John Bull locomotives, each with a single truck under the forward end, and the timber car used by Mr. Williams on the Mohawk and Hudson Railroad, were substantially the same thing as the Plaintiff's car. But these things were all introduced in 1832, and although before the date of the patent, were subsequent to the construction of the Columbus. The Plaintiff shows that whatever these things contained which is embraced in his patent, were contained also in the Columbus; he insists, therefore, that he is in fact the first inventor of them. If this is so then they do not stand in his way.

A great deal has been said in the course of the trial about inventive power, and the *experts* have been asked whether the differences between the Plaintiff's car and those things which preceded it, required the exercise of the inventive faculty. On this point witnesses have been examined on both sides. The Defendants' witnesses say that these prior inventions were substantially like what the Plaintiff has patented, and that it required no genius, after seeing those things, to construct the Plaintiff's car. The experts upon the other side express a decidedly opposite opinion. It is probable that among these gentlemen there is really no great diversity of opinion; but that they attach different meanings to the words invention and principles, &c., and that both speak truly according to their conceptions.

It is right in cases like this, to call experts to give their opinion: other witnesses speak as to facts; but here the opinions of persons skilled in the subject matter of the controversy are asked, and I cherish an habitual respect for the opinions of learned men, thoroughly skilled in a subject on which they are called to speak; but unfortunately they give opposite answers to the same question, and where, as is very apt to be the case, in patent causes, about the same number of experts is called on each side, the case may be left where it would have stood if they had not been called at all, and the jury are in the end obliged to rely upon their own judgments in deciding upon the question on which they, the experts, have given their opinions. Not that evidence of this nature is to be rejected because it is conflicting; but the jury are to determine for themselves upon the weight which ought to be given to it,



upon the one side and the other. And for this purpose it is the duty of the jury in these, as in all other cases, to observe the demeanor of the witnesses under oath, and to observe whether they testify deliberately and with proper reflection, and whether they appear to understand the subject well, and to give such weight to the evidence of each as it shall appear to deserve.

But it is important, gentlemen, that you should understand the precise nature of this objection of the want of novelty in the invention. It is not pretended that any other person previously invented a railroad passenger carriage like the Plaintiff's; all that is insisted is that the things which were before in use for other purposes were so nearly like this that there is no merit in the Plaintiff's invention which entitles him to a patent. The objection is that he has at least but applied an old thing to a new use.

The mere application of an old thing to another use is not the subject of a patent, if it be only to what the law denominates an "*analogous*" use. Thus it has been said, that after the invention of a spoon for the purpose of eating soup, a patent cannot be obtained for the discovery that it could be conveniently used also in eating peas. Nor could there be a valid patent for the use of a coffee mill in grinding pepper. In such cases no ingenuity at all is required to discern the applicability of the old implement to the new use. It is a mere dictate of common sense.

But it is a mistake to suppose that the right to a patent depends on the amount of ingenuity, thought, skill, or experiment, which has led to the invention. Invention means to find out, and it is no matter how the thing is found out; a mere lucky thought may give a man a right to a patent, provided it be of something new and useful. Very often a man in trying to find out one thing finds out another, and yet, though his discovery be not the effect of design, but of mere chance, he is not on this account the less entitled to a patent for it. It is a mistake, therefore, to suppose that to render an invention patentable, it must appear to have been the fruit of extraordinary genius or talents or laborious study; it is no matter how simple the thing is; some of the most important improvements in the history of human progress have been exceedingly simple, or at least now appear so, and there is always danger of doing injustice in estimating the merit of inventions, because when we have become familiar with an invention it may appear to have been very easy when in truth it was far otherwise.

One part of the evidence in the present case will serve to illustrate this. I allude to the deposition of Mr. Jervis, one of the Defendants' witnesses. The effect of it is to show that he devoted a great deal of time and thought before he succeeded in applying the four-wheel truck usefully to the locomotive engine. Mr. Jervis is conceded to be a man of high endowments and of great eminence as a Civil Engineer. I will read to you his account of the introduction and improvement of the engine on the Mohawk and Hudson Railroad.

"I have paid," he says, "a great deal of attention since I have been connected with railroads, to the construction of locomotives and cars. I have a good deal of knowledge of the principle upon which the running part of a locomotive and cars which are now used, and which have been in use since I have been engaged in

my profession, have been constructed and used. My attention has been particularly directed to the subject of the arrangement of the wheels of locomotives and cars, to facilitate the running of locomotives and cars on curves; my attention was very early directed to that subject. It was a subject on which I had often thought a great deal, but made no experiments until 1831. In 1831 and early in 1832, I was very much engaged in devising some means by which four wheels could be substituted for two, as the leading wheels of the locomotive, and finally prepared a plan by which the forward end of the locomotive was supported by a sort of independent carriage, consisting of four wheels. These wheels were placed near to each other, and working under the main frame of the engine, which rested mainly on the outside timbers on friction rollers, supported in its lateral position on the frame of the independent carriage by a centre-pin, and this independent carriage being a substitute for the two wheels formerly used."

Mr. Jervis, you will see, here represents himself to have been, as he doubtless was, an original inventor or contriver of the great improvement which he thus describes; but this was the year after Mr. Winans made a like application of four-wheeled trucks to the Columbus, and about the time of a similar improvement made by him on the locomotive Herald, as testified to by Mr. Alexander.

Now you have seen that both the carriages described in the English books, to which I have referred, are locomotives, designed, however, for purposes very different from the transportation of passengers over long railroads; one of them is exhibited in the drawing with but six wheels, but the inventor has said that where the load was so heavy that it would injure the road, a double pair of driving wheels might be substituted for the single pair of driving wheels with fixed axles, and this suggestion is relied on by the counsel for the Defendants to disprove the novelty of the Plaintiff's invention.

Now these books were equally accessible to Mr. Jervis and to Mr. Winans, and, considering their characters and the nature of the pursuits of these gentlemen, it seems not unreasonable to conclude that they were both acquainted with them. But we see nevertheless, from the evidence of Mr. Jervis, that it was only after long and laborious study, that he succeeded in making an improvement in the locomotive corresponding with that which it is insisted Mr. Winans made in the passenger car. The locomotive in use on the English railway, had one pair of running wheels on a fixed axle, as the passenger carriages both in England and those in this country (then few in number) had a single pair of wheels on a fixed axle at each end; and Mr. Jervis, after the earnest and persevering devotion of his faculties to the subject, and as far as we are apprised, with all the lights possessed by Mr. Winans, at length succeeded in devising and adapting a four-wheel truck for the support of the forward end of a locomotive as Mr. Winans did in devising a like improvement for the support of each end of a passenger car. Now, with these circumstances before us, I must say that it seems to me to be requiring a great deal at your hands to ask you [?] say that there is no merit in what the Plaintiff claims as his invention. But, gentlemen, it is for you to determine whether you find in it anything, substantially different from these other things previously in use.

No one, I believe, pretends that any one of them could be beneficially used for the conveyance of passengers on railways, without extensive modifications; but very slight changes of mechanism may sometimes

be the subject of a patent. A case which has given rise to the litigation in our own Courts, may seem to exemplify this; the patent was for an improvement in the casting of rollers or cylinders. It was known before, that if a revolving motion could be given to the molten iron when poured into the mould, this motion, by force of the centrifugal tendency thus communicated to the fluid, would produce the useful effect of throwing the pure iron to the outside leaving the dross within; and it had long been desired to discover a means of producing this revolving motion in casting rollers or cylinders. A workman employed in an iron foundry at Pittsburgh, discovered that if the melted iron, instead of being poured into the mould in a vertical or horizontal direction, was poured in obliquely, the revolving motion would be obtained. For this purpose it was only necessary to change the direction of the tube already in use, and this is what the man did, and he obtained a patent for his invention, having thereby produced a new and useful result. Another, illustration, by an English judge, is this: if a surgeon goes to a mercer's shop, and sees him cutting velvet or silk with a pair of scissors, and he says, I see how well your scissors cut, and I can, by putting a knob at the end, use them instead of a lancet to cut skin, he might get a patent for that.

The general principle is this, that wherever a man finds out by accident or design, by much or little study, a new and substantially useful thing, and shows how it may be usefully applied, he is entitled to a patent, and the question here for you to decide, gentlemen, is, whether the Plaintiff has not done this. It is certainly no insignificant fact that carriages like that described by the Plaintiff in his patent have superseded the kind of vehicle previously used and are now in universal use in this country. By means of them we have been enabled to construct our roads far more cheaply than we could otherwise do, by admitting curves of comparatively short radii, and yet to run them at high speed, with long, convenient, safe, and strong carriages. But, gentlemen, the question of fact as to the novelty of the invention, is one which you are to decide, and in all that I have said I must not be understood as desiring in any manner to dictate to you the verdict you are to render on this point.

But it is further argued on the part of the Defendants, that admitting the invention of the Plaintiff and its novelty, he has *abandoned* it, by suffering it without objection to go into public use, in the Columbus, the timber cars and the locomotives, and that he cannot now reclaim it. If what is asserted as a fact be true, this result will follow as a legal consequence; thus for example, assuming that Mr. Jervis was the first inventor of the improvement described by him in the locomotive, not having at the time taken a patent for it, and having permitted it to become publicly known and used without objection, he has no longer any right to claim it as his own exclusive property. The law in this respect is just, for otherwise the public would be deceived, and the inventor, after first making all the profit from his invention that he could without a patent, might still secure to himself its exclusive use for fourteen years longer. Does this case come within the rule and within the reason of it, and has there been an abandonment by Mr. Winans of his invention?

The answer given to this objection by the Plaintiff is, that he did not



in fact perfect his invention until the fall of 1834. It is true the Columbus was built and put into use in 1831; but it is described by the witnesses connected with the Baltimore and Ohio Road as imperfect and unsatisfactory,\*and it is insisted that the whole intermediate period until the fall of 1834, was employed by the Plaintiff in making the necessary experiments to perfect it. It was during this period that the other three cars were built, and considering the importance of the subject and the natural anxiety evinced by the gentlemen charged with the interest of the road, as represented by themselves in their depositions, this explanation of the delay seems reasonable. It was not until the fall of 1834 that a carriage of definite form and arrangement was agreed upon and the application of the Plaintiff for a patent seems to have been simultaneous with this determination. Now the law allows to an inventor a reasonable time to make experiments for the purpose of maturing his invention, and ascertaining its practical utility. The object of the patent law is to benefit the public by stimulating ingenious men to the useful exercise of their inventive faculties, and this object is best attained by allowing them sufficient time to achieve the highest degree of success of which they are capable. The law, with certain limitations, accordingly permits this.

If an inventor was required to take out a patent, if at all, upon the first occurrence of a thought of something, apparently promising utility, not only would the policy of the law be obstructed, but inventors would be harrassed and subjected to unnecessary expense. The law, however, requires the inventor to act in this respect with sincerity, good faith, and prudence.

In applying these principles to cases as they arise, deference must necessarily be had to the particular circumstances by which they are characterized. If the invention be of a nature to admit of the necessary experiments by the inventor in his own house, a more stringent rule may rightfully be applied to the case, than to one in which such experiments can only be made in public. Such is the nature of the Plaintiff's alleged invention; and he is entitled to a liberal interpretation of the law of abandonment. It was only on the Baltimore and Ohio Railroad and by the assistance of many persons, that the reality and utility of his supposed invention could be tested, and it was stipulated between him and the Company that he should have the use of the road for this purpose. But it is testified that his cars did not work well, and that from time to time he changed their construction, and that finally, in the fall of 1834, he completed his invention and obtained his patent.

In short, gentlemen, you are to decide whether, under all the circumstances of the case, the Plaintiff is to be considered to have dedicated his invention to the public or to have lost his right by neglect; in other words you are to decide whether he has not fully and fairly acted up to the spirit of the law; if so, his patent is not invalidated by delaying his application for it.

Lastly, it is denied by the Defendants that they have infringed the Plaintiff's rights, admitting the validity of his patent. Several witnesses have testified, in general terms, that the carriages in use on the Defendants' road, as well as on the other railroads in this State, are substantially like that described in the Plaintiff's patent; and Mr. Pond testifies that he saw cars in use upon the Defendants' road, hav-



ing certain iron work upon them made by him for the Defendants ; while on the other hand, some of the witnesses for the Defendants have pointed out certain differences between these carriages and that of which the Plaintiff claims to be the inventor.

But, gentlemen, this question of infringement is one upon which you are to form and express your own judgment. It may not be amiss to observe, that it is no reproach to the Defendants in particular, that they infringe the Plaintiff's patent, if they do so, and the Plaintiff is not seeking exemplary damages from them. It is stated to be his desire simply to settle his rights, and it is accordingly agreed that if you find for the Plaintiff the damages shall be assessed at one hundred dollars.

After concluding his charge, his Honor, Judge Conkling, in answer to several prayers for instructions offered by the Defendants' counsel, further instructed the jury in substance as follows :

'That it was undoubtedly true that a patent could not be taken merely for a purpose, end, or object, but that he doubted the pertinency of any instruction on that point in this case, because the patent here was not for a purpose, but for the means of effecting a purpose ;

That the specification was sufficient if the patentee had described a carriage susceptible of an attachment of the power to the body, and if the drawing showed such mode of attachment, and that the Plaintiff suffered no disadvantage from not stating it in his written specification, and although the drawing was not to be taken into consideration for the purpose of measuring the extent of the claim, yet it might be considered in ascertaining whether what he claimed was new ;

That the patent was valid if the Plaintiff's car was substantially on the whole a new and useful thing ;

That if a thing substantially like the Plaintiff's car, had been described prior to his invention in some public work that had been produced, then the patent was not good ; but that it was not enough that the description should merely suggest the idea of the invention ;

That it was a question of fact for the jury, whether the specification was sufficiently exact and intelligible in reference to the position of the trucks ;

That, in order to find for the Plaintiff, the jury must be convinced that what the Plaintiff had patented is useful, but that any degree of utility was sufficient to support a patent—the word useful in the patent law being used in opposition to frivolous or noxious ; and that with regard to the question of side bearings, although the jury should think it better to have longer bearings than the Plaintiff contemplated, that could not take away the utility of his invention, as it was not necessary that the thing patented should be the best possible thing of the kind that could be made ;

That if the jury believe that the intermediate time between putting the Columbus into use and the taking out of his patent was devoted by the Plaintiff in good faith to perfecting of his invention, he cannot be considered as having abandoned it ; but that if the invention was perfected in the Columbus, there could be no need of farther experiment ;

That in order to warrant the jury in finding an infringement by the Defendants, they must be shown to have used either the same thing, or substantially the same thing, as the Plaintiff's invention.

The jury thereupon retired to deliberate on their verdict, and returned into Court and delivered their verdict in favor of the Plaintiff, for the stipulated damages and costs.

[For charge of Chief Justice Taney referred to and adopted by Judge Conkling see p. \*423, 1131.]

UNITED STATES CIRCUIT COURT, NORTHERN DISTRICT  
OF NEW YORK.SCHENECTADY AND TROY RAILROAD COMPANY *adsm.* ROSS WINANS.

The motion for a new trial in this cause was argued upon the case made therein and hereinbefore set forth, at the June Term of this Court, before Justices NELSON and CONKLING, and afterwards, on the first day of September, 1851, the said Court directed the following Rule, denying a new trial, to be entered, to wit:

SCHENECTADY AND TROY RAILROAD COMPANY *adsm.* ROSS WINANS.SEPT. 3d, 1851. HAMILTON HARRIS, *Plaintiff's Attorney.*

A motion having been made in this cause for a new trial, Ordered, on motion of Hamilton Harris, Plaintiff's Attorney, that the same be denied. A true copy: A. A. BOYCE, *Clerk.*

Which decision was accompanied by the following Opinion:

SCHENECTADY AND TROY RAILROAD COMPANY *ads.* ROSS WINANS.

NELSON, J. I. I have examined the various grounds presented by the counsel for the Defendants on the motion for a new trial, and after the fullest consideration, am of opinion the motion must be denied.

Most of the exceptions taken at the trial and relied on in the argument here, are founded upon what we regard as an entire misapprehension of the thing claimed to have been discovered by the Plaintiff, and for which the patent has been issued. This will be seen on a reference to the instructions prayed for by the Defendants, upon which most of the questions in the case arise. They assume that if any material part of the arrangement and combination in the construction of the cars or carriages described in the patent was before known or in public use, it is invalid; and hence various parts were pointed out by the counsel at the trial and the Court requested to charge that if either of them was not new, the jury should find a verdict for the Defendants.

Now the answer to all this class of exceptions is, that the patentee sets up no claim to the discovery of the separate parts of the arrangement which enter into the construction of his cars; these may be old and well known when taken separately and detached, for aught that concerns his invention. His claim is for the car itself, constructed and arranged as described in his patent. This, I think, is the clear meaning of the specification and of the claim as pointed out in it; proving, therefore, that parts of the arrangement and construction were before known amounted to nothing. The question was, whether or not cars or carriages for running on railroads as a whole, substantially like the one

described in the patent, had been before known or in public use, not whether certain parts were or were not substantially similar.

The argument presupposes that the claim is for the discovery of a new combination and arrangement of certain instruments and materials, by means of which a car is constructed of a given utility; and that if any one or more of the supposed combinations turns out to be old, the patent is invalid. This is the principle upon which much of the defence has been placed, but no such claim is found in the patent; no particular combination or arrangement is pointed out as new, or claimed as such. The novelty of the discovery is placed upon no such ground; on the contrary, the result of the entire arrangement and adjustment of the several parts described, namely, the railroad car, complete and fit for use, is the thing pointed out and claimed as new. This is the view taken by the CHIEF JUSTICE of the patent, in the case of the present Plaintiff, against the "Newcastle and Frenchtown Turnpike and Railroad Company," tried before him in the Maryland Circuit and which was adopted by the Judge in the trial of this case.

II. It was further insisted on the part of the Defendants, that if the relative position of the two bearing carriages to each other constitutes a material part of the arrangement in the construction of the cars, the patent was void unless the jury should find, that the specification described with sufficient precision the location of these bearing carriages under the body of the car, so as to enable a mechanic of skill in the construction of cars, to place them at the proper distance apart without experiment or invention.

It was also contended, that the remoteness of the bearing carriages from each other, was not so described in the specification as to constitute any part of the improvement. In respect to this branch of the case, the Court charged that the relative position of the bearing carriages to each other in the construction of the car, was a material part of the arrangement of the patentee, and left the question to the jury whether or not he had sufficiently described the position of the trucks, having in view their distance apart, and also from the ends of the car body, suggesting at the same time, that the location must always depend in a measure upon the length of the body. It will be seen on looking into the specification, that the location of the trucks relatively to each other under the body, as well as the near proximity of the two axles of the truck to each other, form a most essential part of the arrangement of the patentee in the construction of his cars.

Great pains have been taken to point out the defect in the existing four-wheel cars, and the impediments to be encountered and overcome in the running of cars upon railroads, as the latter are usually con-



structed. The patentee states that, "In the construction of them, especially when of considerable length, it has been found necessary to admit of lateral curvatures, the radius of which is sometimes but a few hundred feet, and that it becomes important, therefore, to so construct the cars as to enable them to overcome the difficulties presented by these curvatures, and to adapt them for running with the least friction practicable on all parts of the road. The friction referred to, is that which arises between the flanches of the wheel and the rail, causing great loss of power, destruction of the wheels and rails, besides other injuries." For this purpose, he constructs two bearing carriages, each with four wheels, which are to sustain the body of the passenger or other car by placing one of them at or near each end of it, as particularly described. The two wheels on either side of the trucks are to be placed very near each other — the spaces between the flanches need be no greater than is necessary to prevent their contact with each other."

"The car body rests upon bolsters supported on each of the two bearing carriages or four-wheel trucks, the bolsters so constructed as to swivel or turn on each other, like the two front bolsters of a common wagon. The body of the car may be made of double the length of the four-wheel car, and is capable of carrying double its load."

The truck may be so placed within the ends of the car as to bring all the wheels under it, or without the end so as to allow the body to be suspended between the two bearing carriages.

The patentee further states, that "the closeness of the fore and hind wheels of each bearing carriage, taken in connection with the use of the two bearing carriages, arranged as distant from each other as can conveniently be done for the support of the car body, with a view to the objects and on the principles before set forth, is considered by him as an important feature of the invention; for, by the contiguity of the fore and hind wheels of each bearing carriage while the two bearing carriages may be at any desirable distance apart, the lateral friction from the rubbing of the flanches against the rails is most effectually avoided, while at the same time all the advantages attendant upon placing the axles of a four-wheeled car far apart, are obtained."

"The two wheels on either side of the bearing carriages may, from their proximity, be considered as acting like a single wheel, and as these two bearing carriages may be placed at any distance from each other consistent with the required strength of the body of the car, it is apparent that all the advantages are obtained which result from having the two axles of a four-wheeled car at a distance from each other, while its inconveniences are avoided."

Among the principles stated by the patentee to be taken into consid-

eration in the construction of the car is, that the greater the distance between the axles, while the length of the body remains the same, the less the influence of shocks and concussions occurring on the road; and hence the relief from them, when the trucks are placed under the extreme ends of the body, is greater than when placed midway between the centre and the end.

It is apparent from what we have already referred to in the specification, and still more manifest on a perusal of the whole of it, that the improvement in this part of the arrangement, does not consist in placing the axles of the two trucks at any precise distance apart in the construction of the car, or from each end of the body. The distance used must necessarily depend somewhat upon the length of the car and strength of the materials of which it is built, and hence it was impracticable to specify in feet or inches the exact distance from the ends of the car body at which it would be best to arrange the trucks.

Neither do the advantages of a car, constructed and arranged as described, depend upon the trucks being placed at a specified distance from the ends, or so that there may be a specified distance between the axles. Having in view the defects in the existing cars and other difficulties to be encountered, some considerable latitude may be allowed in this respect consistent with the object sought to be attained, to remedy the defects in the existing cars.

All the principles for the construction of one for the purpose of overcoming these difficulties and remedying these defects, are particularly set forth in the description given by the patentee. We think the specification sufficient, and that the Court was right in the opinion expressed on this branch of the case.

Any mechanic of skill could readily arrange the bearing carriages in connection with the body of the car so as to secure the advantages so minutely and clearly pointed out, and which are shown to attend the practical working of cars constructed in the manner described.

III. The questions of originality and of infringement were questions of fact and depending upon the evidence, and were properly submitted to the jury. We think the weight of it decidedly with the verdict.

IV. The patent in this case was originally issued first October, 1834, and was recorded anew seventh of June, 1837, according to the Act of Congress of the third of March, 1837, (5 St. at large 191.) No drawings were attached to the original patent nor was there any reference therein to drawings. On the 25th of September, 1848, the patent was extended for the term of seven years from the first of October, 1848. The Plaintiff gave in evidence at the commencement of the trial, a certified copy of the patent and specification, certificate of the extension,

drawing with references to the same, and an affidavit of the Plaintiff made November nineteenth, 1838. The drawing was not filed at the time the patent was recorded anew, but was filed on the nineteenth of November, 1838. The counsel for the Defendant objected to the evidence on the grounds, 1st: That it appeared that no drawing was annexed to the original patent, and 2d, that the Act of Congress did not make such a drawing evidence. The court also instructed the jury in summing up the case, that the drawing, a certified copy of which had been given in evidence, was to have the same force and effect as if it had been referred to in the specification, and was to be deemed and taken as part of the specification.

The first section of the act of 1837 provides that any person interested in a patent issued prior to the fifteenth of December, 1836, may without any charge, have the same recorded anew, together with the descriptions, specification of claim and drawings annexed, or belonging to the same; and it is made the duty of the Commissioner to cause the same, or any authenticated copy of the original record, specification or drawing which he may obtain, to be transcribed and copied into books of record kept for that purpose; *and whenever a drawing was not originally annexed to the patent and referred to in the specification, any drawing produced as a delineation of the invention, being verified by oath in such manner as the Commissioner shall require, may be transmitted and placed on file or copied as aforesaid, together with the certificate of the oath, or such drawings may be made in the office under the direction of the Commissioner in conformity with the specification.*

The second section provides, that copies of such record and drawings, certified by the Commissioner, or in his absence by the chief Clerk, shall be prima facie evidence of the particulars of the invention, and of the patent granted therefor, in any judicial Court of the United States, in all cases where copies of the original record or specification and drawings would be evidence, without proof of the loss of such originals. This section also provides that no patent issued prior to the aforesaid fifteenth day of December, 1836, shall, after the first day of June then next, be received in evidence in any Court on behalf of the patentee, unless so recorded anew, and a drawing of the invention, if separate from the patent, verified as aforesaid and deposited in the Patent Office. See also section third of the same Act.

It is quite clear, upon the above provisions of the Act, that the Court was right in admitting the drawings in connection with the patent and specification in evidence. The whole together are made prima facie evidence of the particulars of the invention and of the patent granted therefor.

The weight to be given to the drawings furnished under the Act, by way of enlarging or explaining the description as given in the specification, is another question. That will depend upon the circumstances of each particular case. As a general rule they will not be effectual to correct any material defect in the specification unless it should appear that they correspond with one accompanying the original specification for the patent, otherwise, in case of discrepancy between the drawing and specification, the latter should prevail. Care must be taken to avoid imposition by the use of the newly furnished drawing, and for this purpose the specification will afford the proper correction, unless the Plaintiff goes further and shows that it conforms to the one originally filed.

The charge that the drawing in this case was to have the same force and effect as if it had been referred to in the specification and was to be deemed and taken as part of it, was perhaps too strong, as it respects the drawings furnished under the act of 1837. The principle is true as it respects those accompanying the original application for the patent, but can hardly be said to be applicable to the full extent stated, in the case of these newly furnished drawings. The principle might open the way to imposition and fraud. Assuming that there is nothing but the oath of the party attesting that the drawing affords a true delineation of the invention, the specification should prevail in a case of a material discrepancy. But admitting the instruction in this respect not to be strictly correct, and that too much weight was given to the drawing, we do not see that it would have altered the result.

The specification afforded a sufficient description of the invention independently of the drawing. Some slight additions that improved the working of the car, were open to some question, whether they were embraced in the specification, but they did not enter into the essence of the invention, or constitute any substantial part of the improvement. Time and experience usually indicate these slight additions and alterations, and they should be regarded as consequential results, belonging to the inventor. It requires time and experience usually to perfect the machine, and improvements derived therefrom are justly due to him.

V. As to the prior use of the car Columbus and others constructed by the patentee before he made application for his patent, we think the instruction of the Court correct. The law allows the inventor a reasonable time to perfect his invention by experiments; and these could be made in this instance only by putting the car in the service of those controlling lines of railroads. There were repeated failures in the experiments tried, and the cars abandoned before the perfection of the car described in the patent. These experiments and trials sufficiently



account for the previous use set up by way of forfeiture of the invention.

Upon the whole, after a careful examination of the case, and of all the points made by the Defendants on the argument, many of which have been noticed above, we are satisfied that the verdict is right, and that a new trial should be denied.

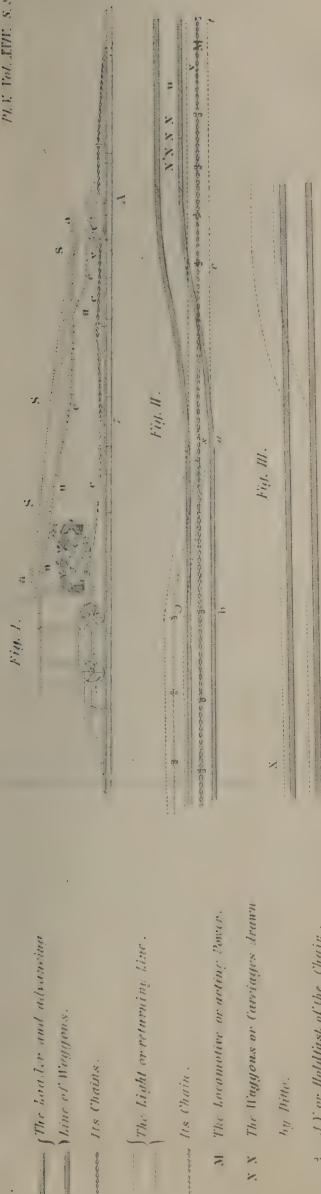
(Filed Sept. 1, 1851.)

I hereby certify that the foregoing is a true copy of an opinion by his Hon. Mr. Justice Nelson, filed with me the first day of September, 1851.

SAMUEL BLATCHFORD,

*Reporter of the Circuit Courts of the United States  
within the Second Circuit.*





*Phil. W.*

# NOTES

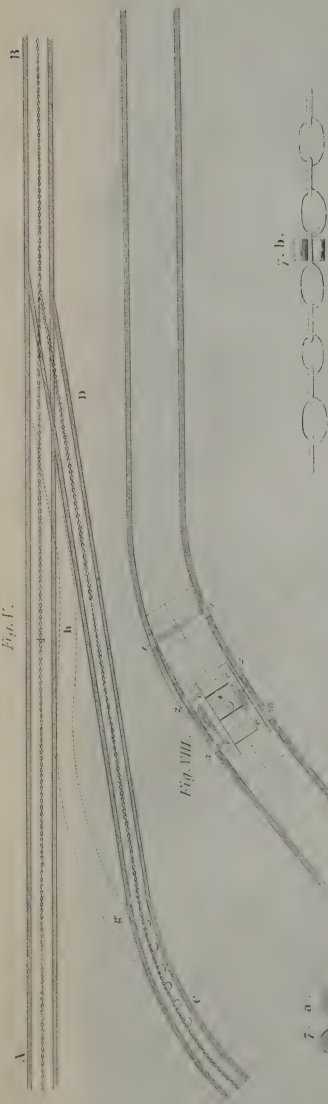


Fig. 17.

Fig. 11.

*The Loader and Advancing  
Line of Waggon.*  
*Its Chais.*

*The Light on returning line.*  
*Its Chain.*

M *The Locomotive or Active Power.*XXV *The Waggoners or Carriages drawn*

by Dille.

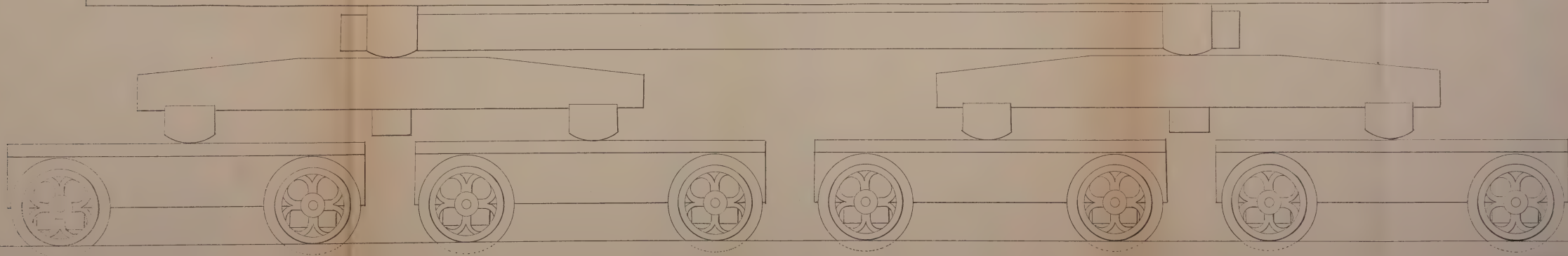
*For Holdfast of the Chain.*

J. M. Davis, Jr.





60 TONS.

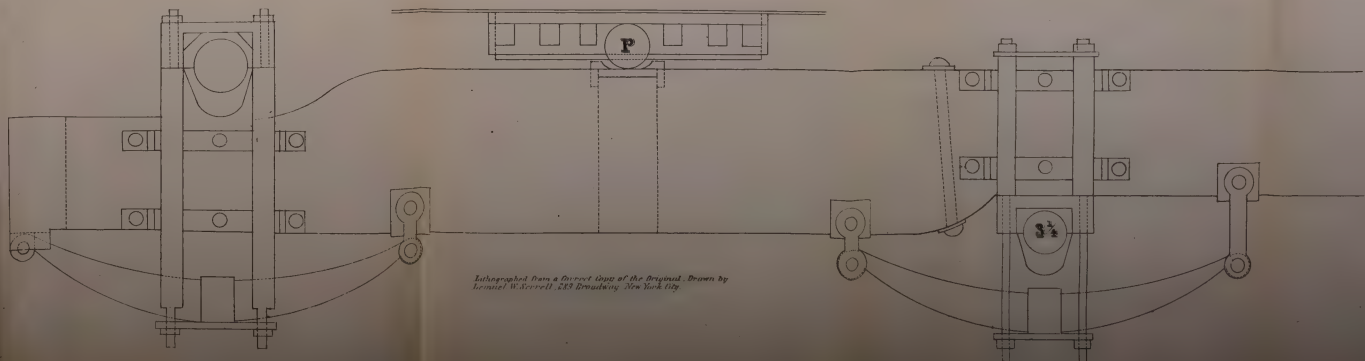
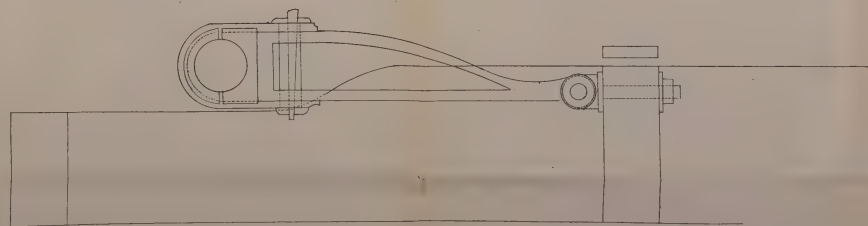
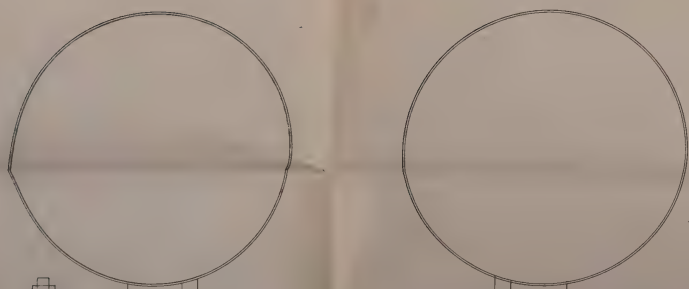
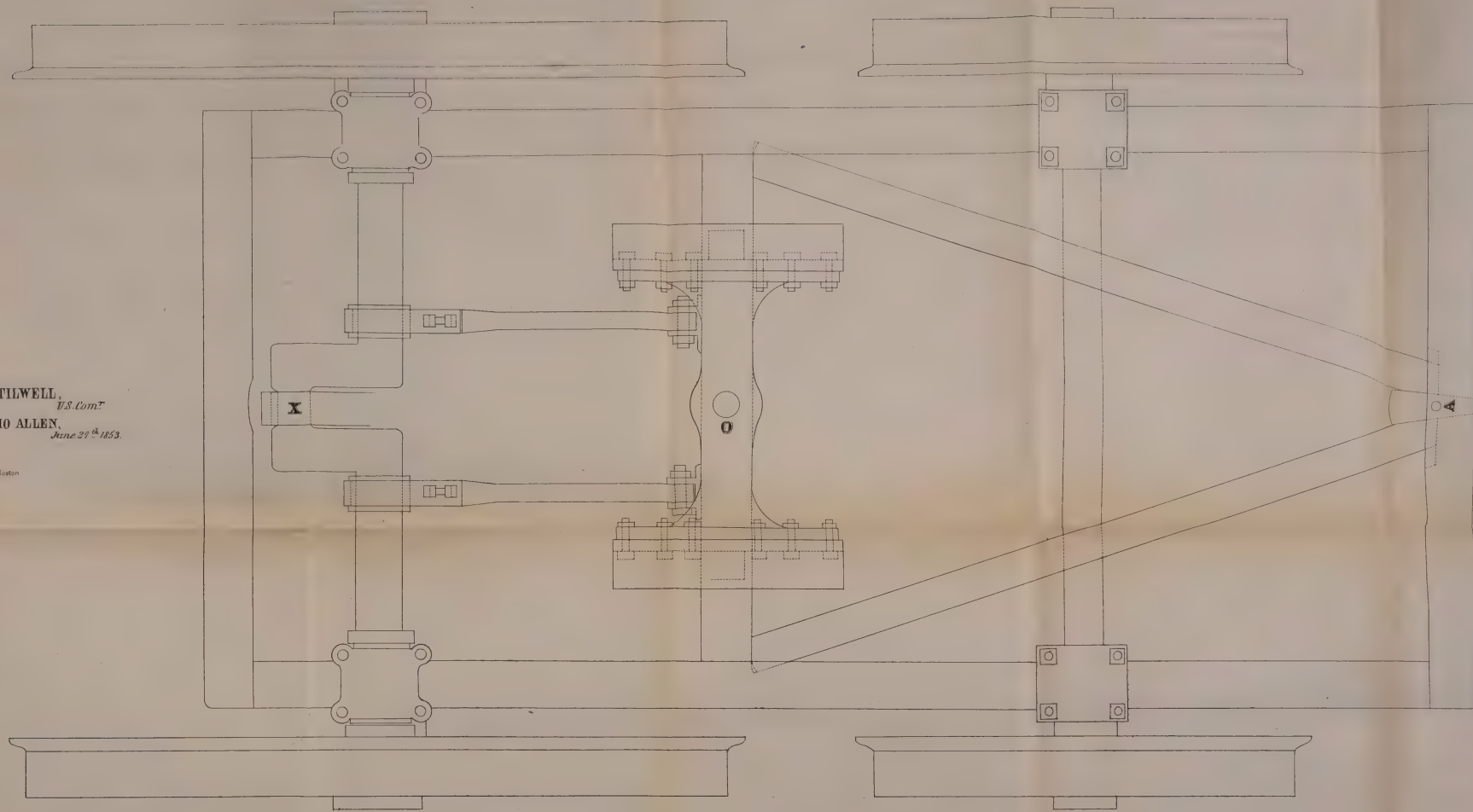




**C**

R. E. STILWELL,  
U.S. Comr.  
HORATIO ALLEN,  
June 27<sup>th</sup> 1853.

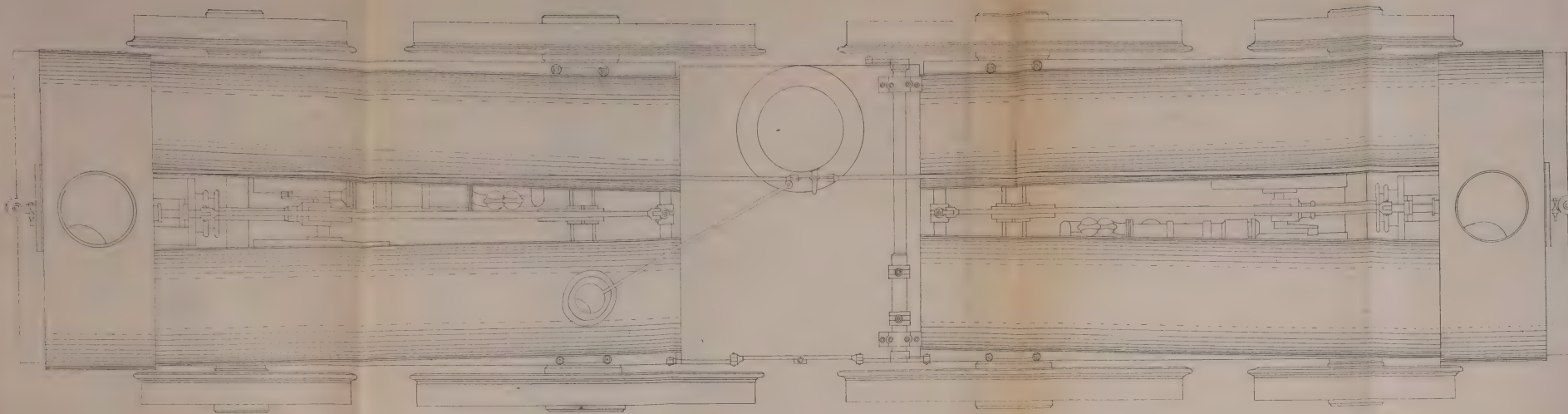
3/8 Cheater 5/8 inch 104 West St Boston



Engraved from a correct copy of the Original. Drawn by  
Lester W. Russell, 225 Broadway New York City.

17

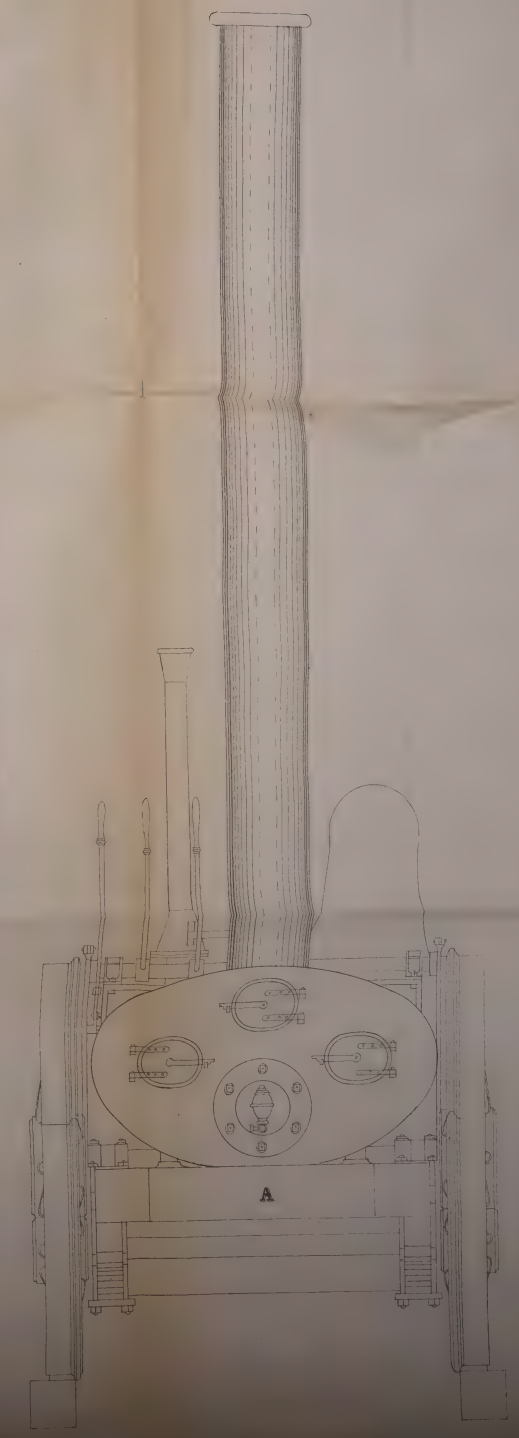
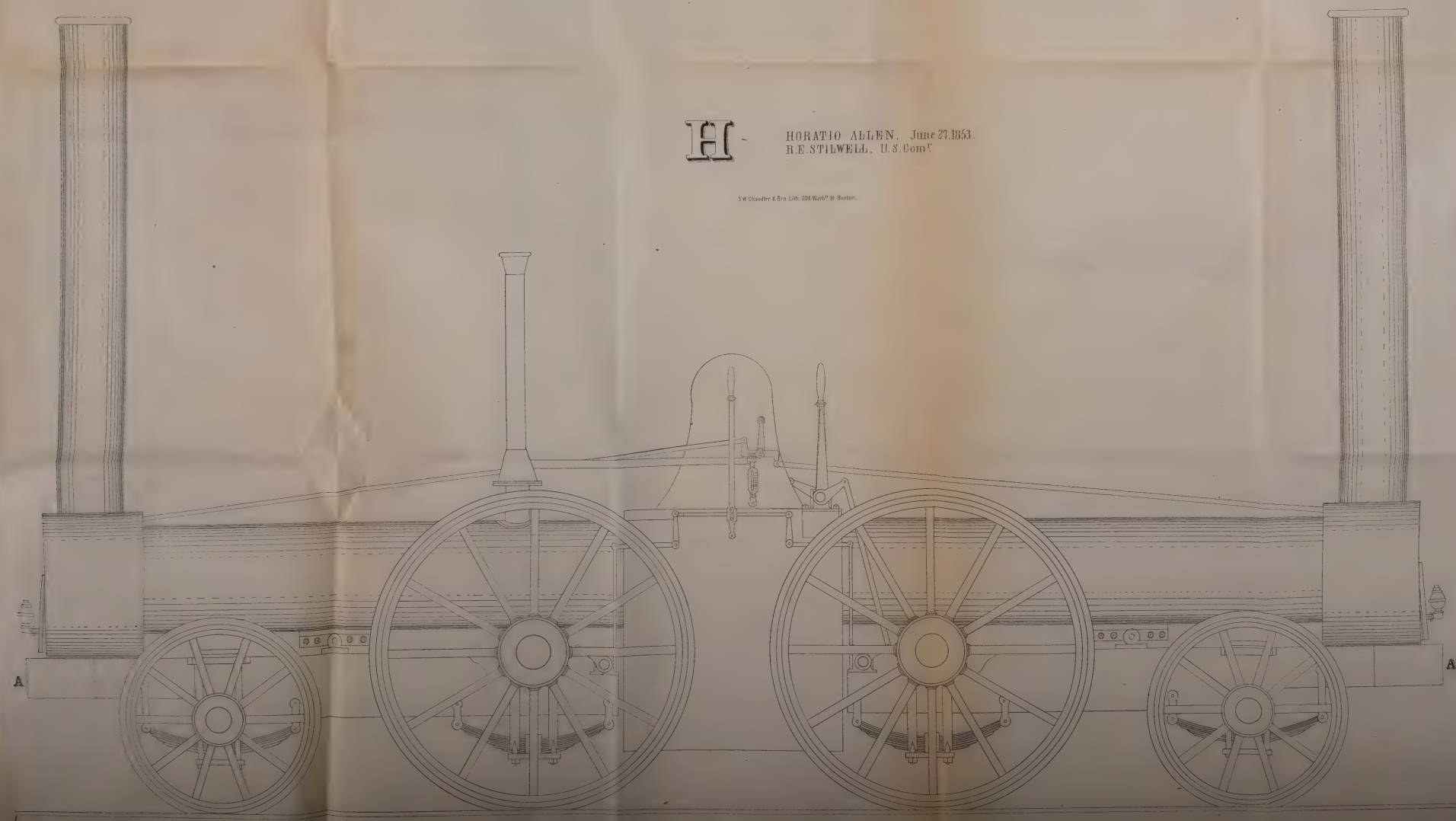




H

HORATIO ALLEN, June 27. 1853.  
R.E. STILWELL, U.S. Comr.

S.W. Chandler & Bro. Lith. 208 Wash. St. Boston.



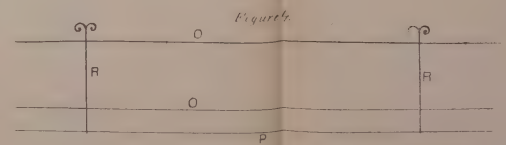
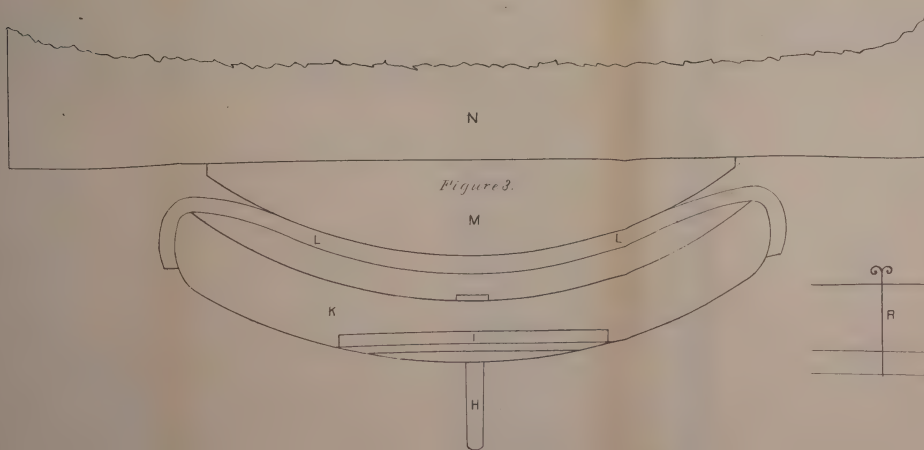
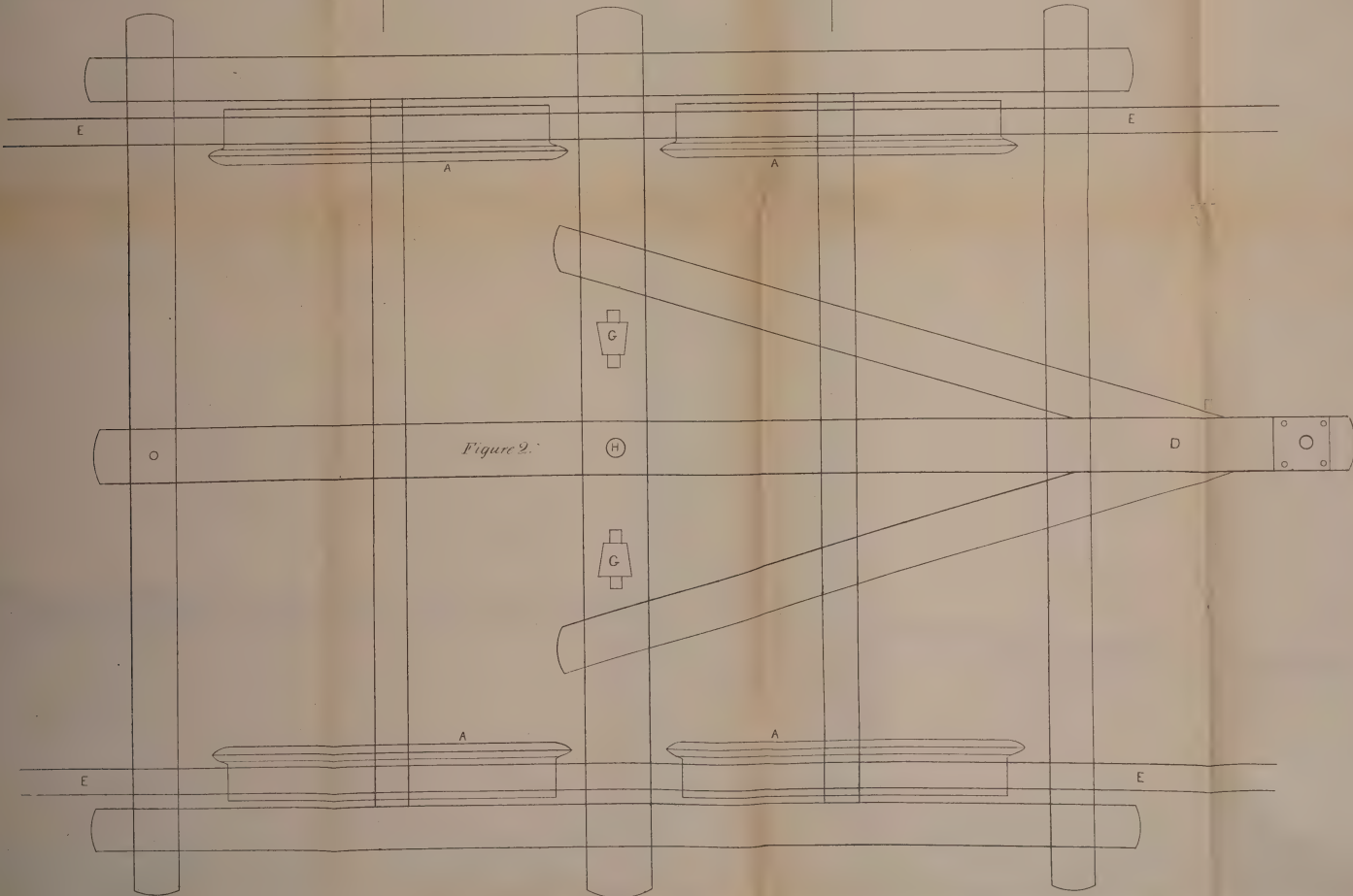
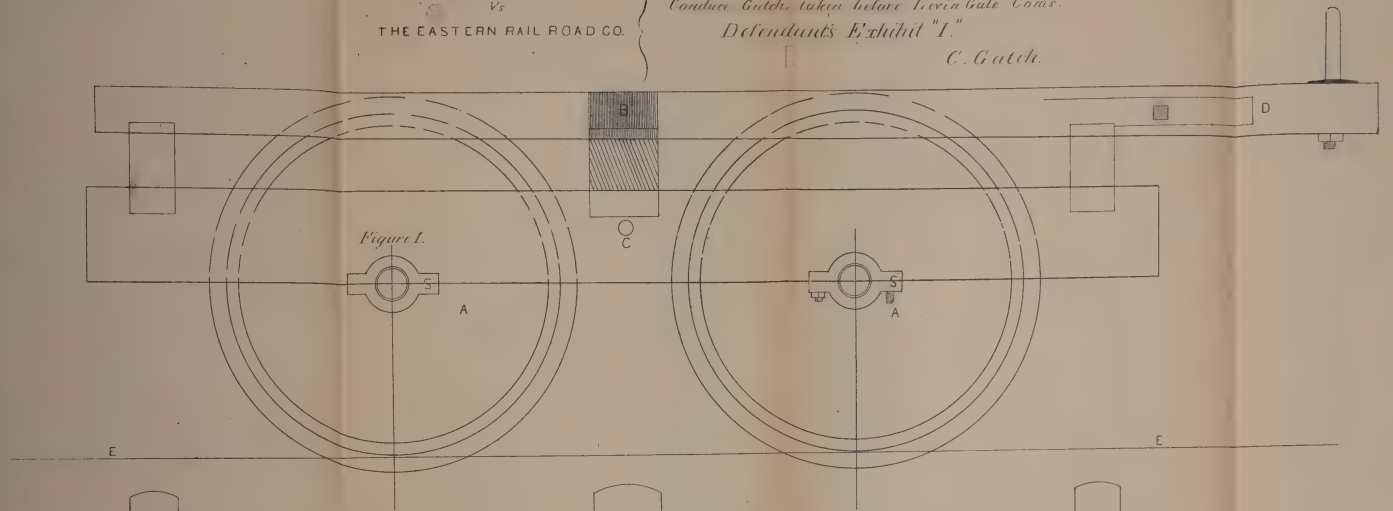


ROSS WINANS  
Vs  
THE EASTERN RAIL ROAD CO.

Defendant's Exhibit I referred to in the Deposition of  
Conductor Gatch, taken before Levin Gule Coms.

Defendant's Exhibit "I."

C. Gatch.



J.H. Ballou & Co. Lith.



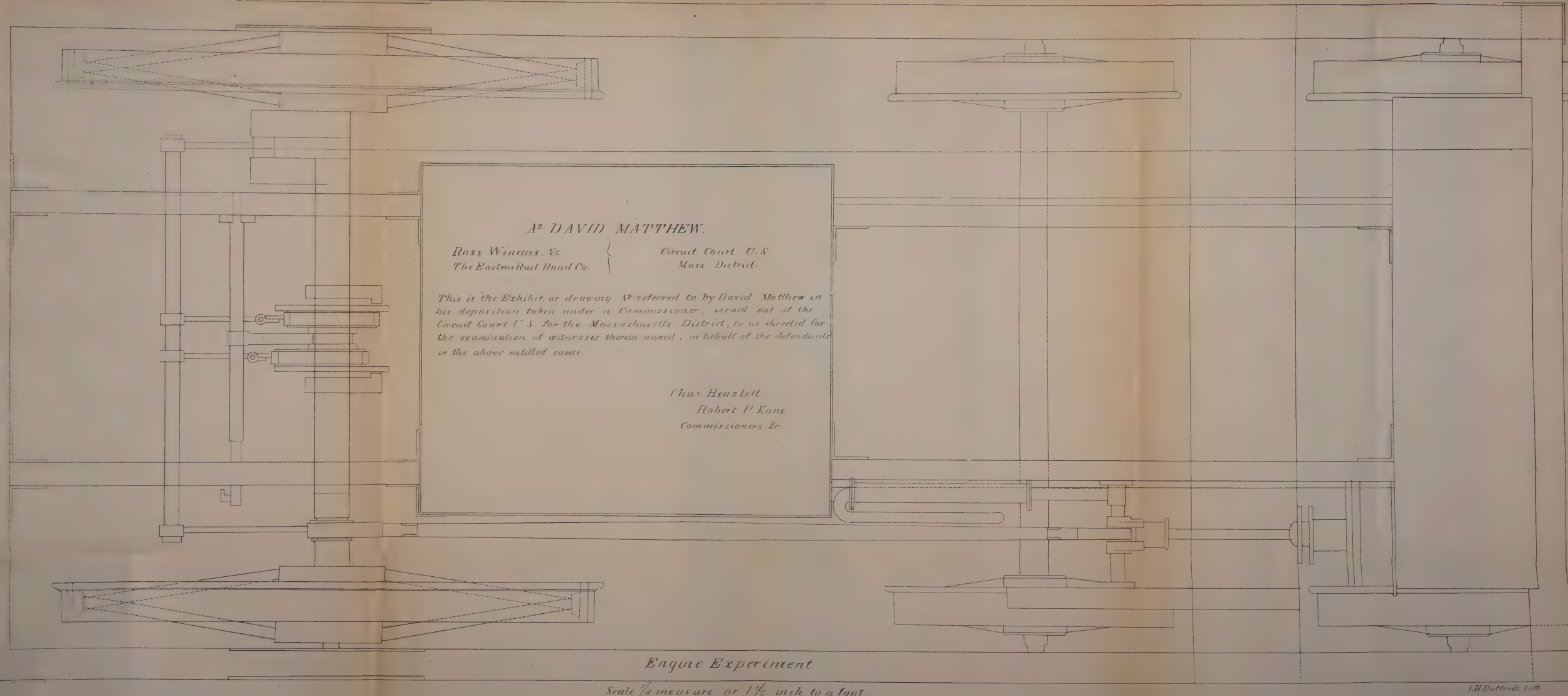


Defendants exhibit G. referred to in the depositions of Conduce Gatch, Jacob Rupp.  
& John M. Eichelberger, taken before

Alon Gale  
from

ibit G.  
Jacob Kupper  
Condau Gatch  
John A. Kichelberger





A<sup>2</sup> DAVID MATTHEW.

Ross Winans, Vs.  
The Eastern Rail Road Co.

Circuit Court U. S.  
Mass. District.

This is the Exhibit, or drawing A<sup>2</sup> referred to by David Matthew in his deposition taken under a Commissioner, issued out of the Circuit Court U. S. for the Massachusetts District, to us directed for the examination of witnesses therein named, in behalf of the defendants in the above entitled cause.

Chas. Hazlett.  
Robert P. Kane.  
Commissioners &c.

Engine Experiment.

Scale  $\frac{1}{8}$  measure or  $1\frac{1}{2}$  inch to a foot.

MATTHEW.

12 clark  
" " " " " "



A3 DAVID MATTHEW.

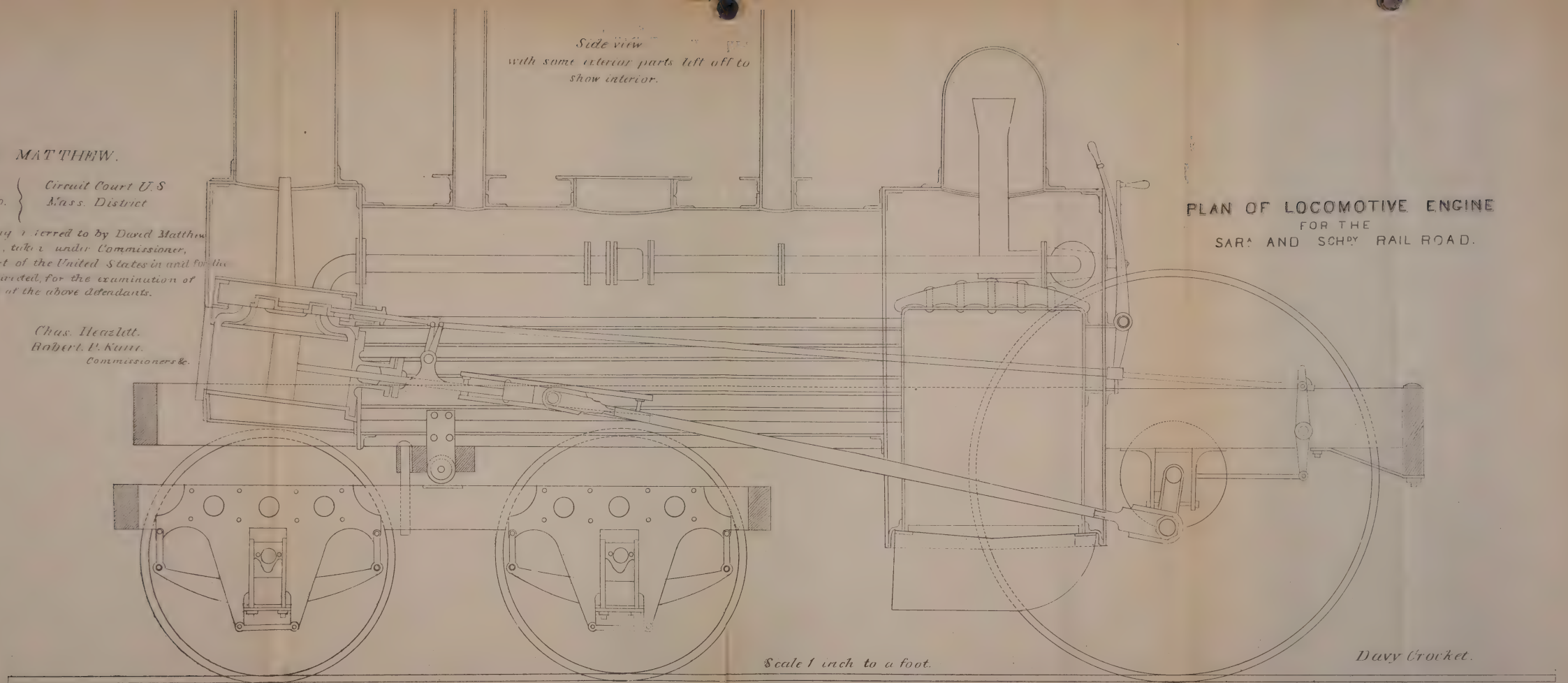
Hans Winans Vs. }  
The Eastern Rail Road Co. } Circuit Court U.S.  
Mass. District

This is the exhibit or drawing referred to by David Matthew as exhibit A3, in his deposition, taken under Commission, issued out of the Circuit Court of the United States in and for the Massachusetts District, to us directed, for the examination of witnesses therein named in behalf of the above defendants.

Chas. Hazlett.  
Robert V. Kerr.  
Commissioners &c.

Side view  
with some exterior parts left off to  
show interior.

PLAN OF LOCOMOTIVE ENGINE  
FOR THE  
SARASOTA AND SCHREY RAIL ROAD.

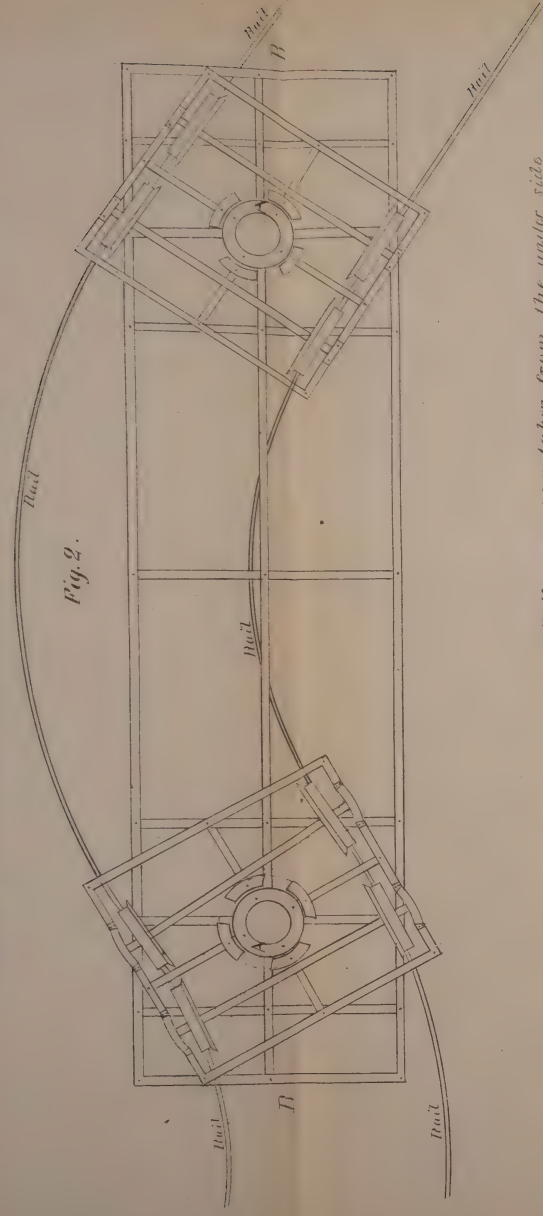


Scale 1 inch to a foot.

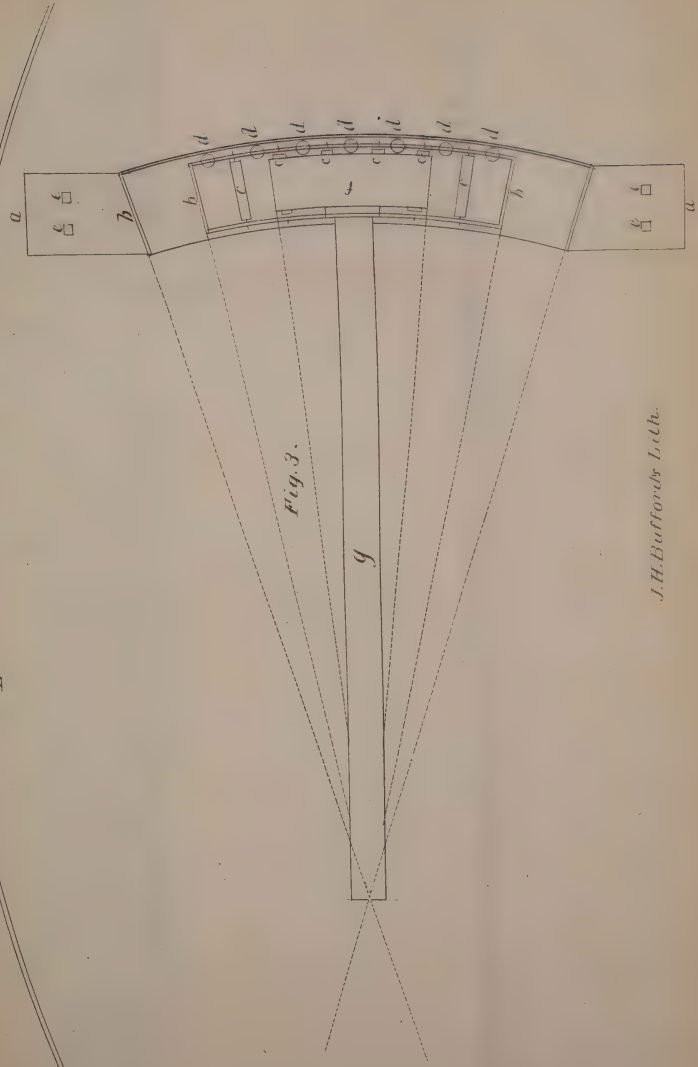
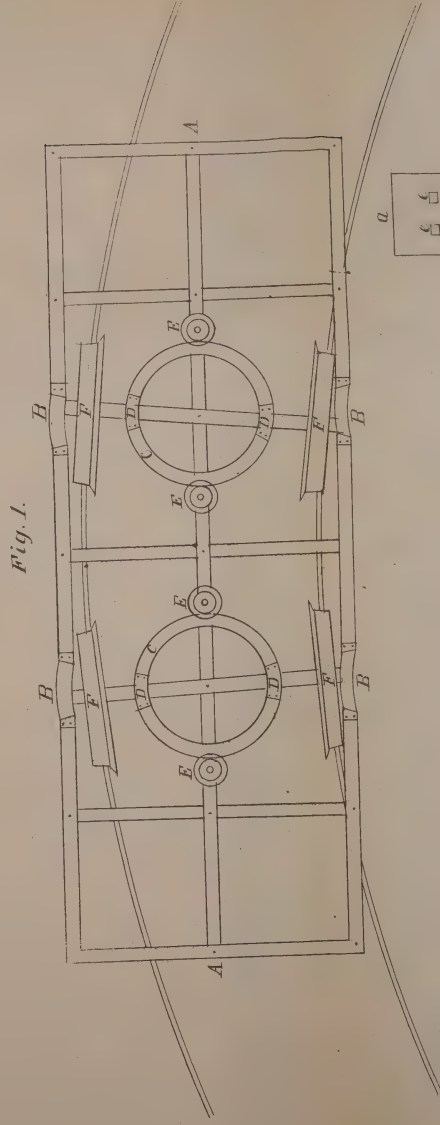
Davy Crockett.



*Drawings  
of  
Janus P. Fairbank's Improvements in constructing Rail Road Cars.*

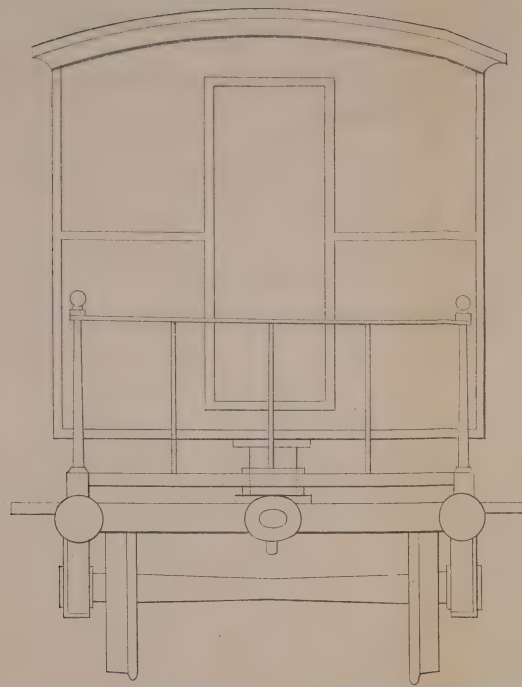


N.B. All these drawings, except the Rail ways, are taken from the under side of the bars, for the purpose of showing the best exposition.



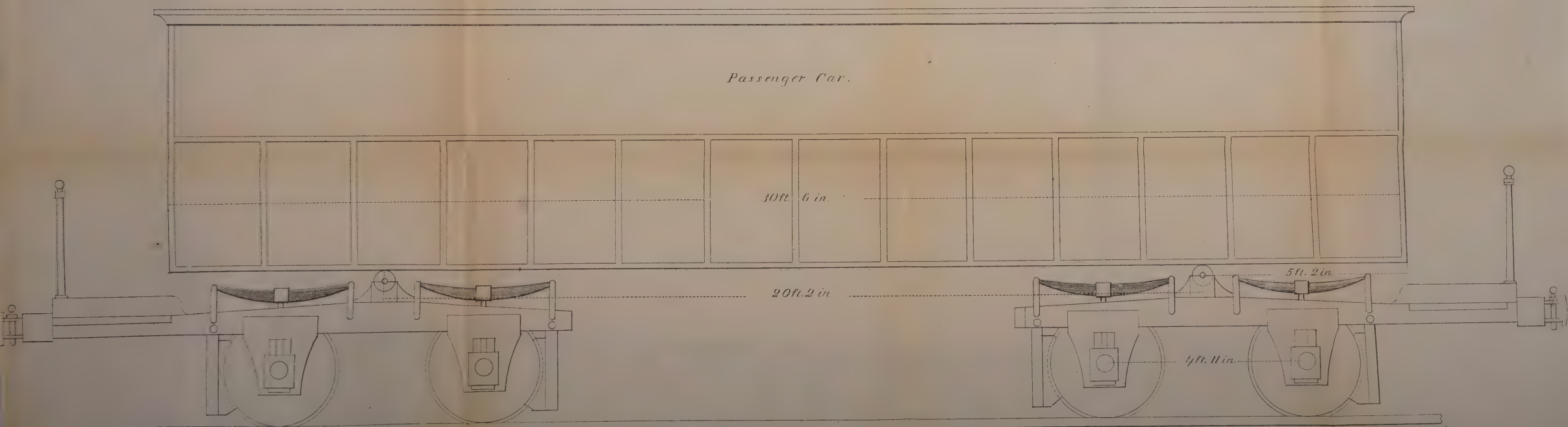






G. S. G.

B. & P. R. R. Commissioner annexed to  
answer to 7th. add. Cross Introg.



J. Richards.

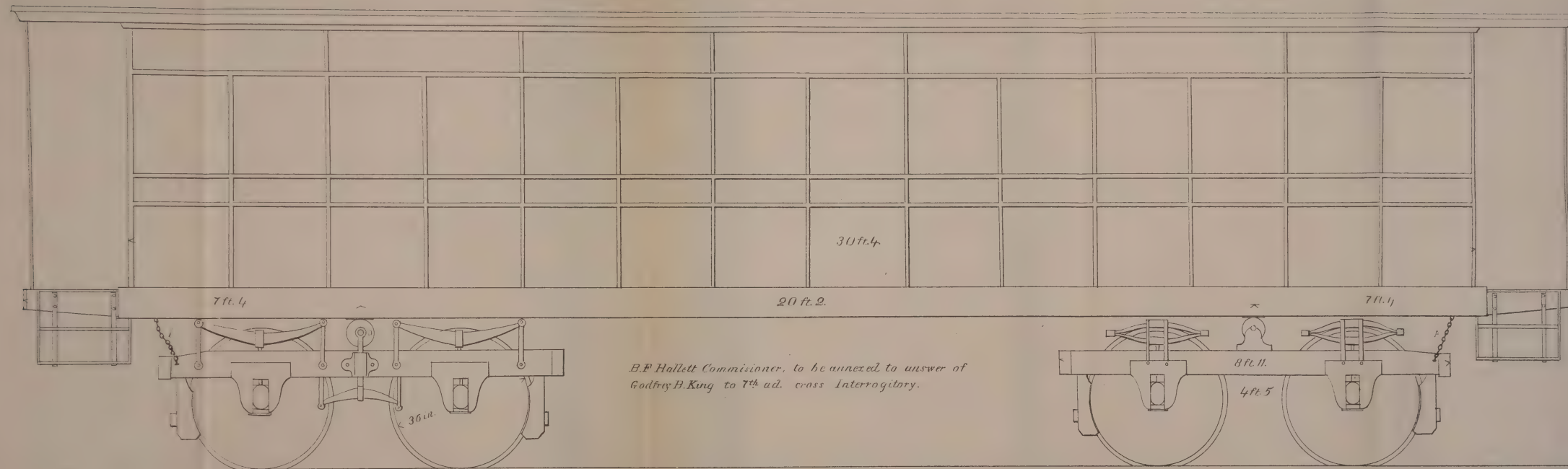
Built at the shops of the B. & P. R. R. Co.

Commenced in March and placed upon the road in September 1838.

G. S. Briggs Supt. of Motive Power.

J. H. Ballou's Lith.





*B.F. Hallett Commissioner, to be annexed to answer of  
Godfrey H. King to 7<sup>th</sup> ad. cross Interrogatory.*





*Annexed in answer to 40th Interrog'y  
R.F. Hallett, Com.*

4 f.  $5\frac{3}{4}$  inches.

4f. 6 1/2

4f. 7 1/2.

4f. 8 1/2



*Patented, Nov. 11, 1851.*

: W. Chandino & Gro. Lith. 234 Wash<sup>n</sup> St. Boston.

*Fig. 1.*

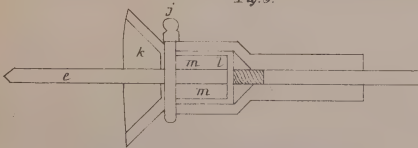
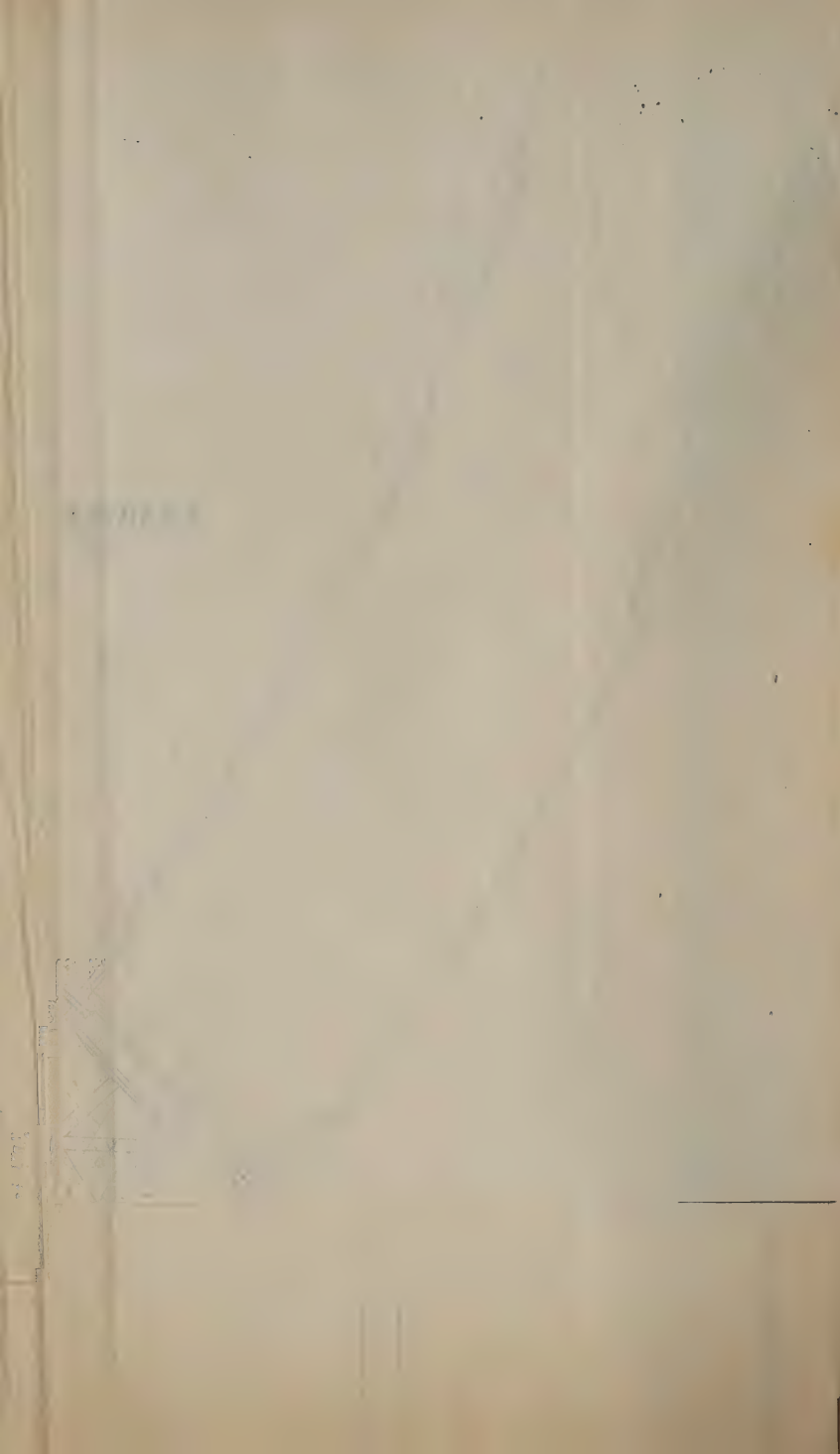


Fig. 3.

Fig. 2.





ROSS WINANS

VS.

THE EASTERN RAILROAD CO.

Defendant's Exhibit L, referred to in the deposition of Conduce Gatch, taken before LEVIN GALE, Commissioner.

# DEFENDANT'S EXHIBIT "L"

C. GATCH.

## Accident on the Baltimore and Ohio Railroad.

The subject of our illustration gives a view of the serious accident which lately occurred on this road. About three o'clock in the afternoon, the train, consisting of a baggage and three passenger cars, drawn by one heavy and one small engine, when passing the eighty feet filling, on section seventy-six, descending a curved grade of one hundred and sixteen feet to Cheat River, about seventy miles west of Cumberland,

the large engine started some nails that bound the rails to the chestnut cross-ties. All got over safely but the two last passenger cars, which, in consequence of the parting of the track,

were thrown down to the river side—over one hundred feet—making four somersets in the descent. There were forty passengers in the two cars, and the following is a list of the dead:—Daniel Holt, of Baltimore, (of the firm of Holt and Malthy, oyster dealers); Aurelius Sallie, supposed from Carolina; Lewis Deline, a French emigrant, returning from California; Richard Clayton, of Wellsville, Va.; a young lady and a middle-aged gentleman, both unknown, but supposed from Kentucky; a young stepson of Robert Murray, a supervisor on the railroad; a child of Mr. Geise, of St. Louis, on his way to New York; and Mr. Geise and lady are both much injured.

It is said that the train was going at moderate speed, and the accident was unavoidable.

Mrs. Ogle, of Philadelphia, was in the train to which the accident happened. The following is a list of the wounded:—F. S. Close, injured severely in the back; Adam Zoll, of Rockingham, Va., injured slightly; George Calvert, of Fauquier county, Va., do.; Abner Floweree, of Salem, Fauquier county, Va.; H. A. Turner, of Baltimore, with his wife and four children, bruised, burned, etc.—will get well. G. A. Travenier, Alexandria, Va., back injured, not fatally; C. Saunders, of Shelby, Kentucky, severely burnt and cut; Dr. Cadwallader, a merchant of Louisville, thigh broken in three places, and injured in the breast; Gardner and Morris, brakemen, severely injured.



FRIGHTFUL ACCIDENT ON THE BALTIMORE AND OHIO RAILROAD.











